the OIL AND GAS JOURNAL

NOVEMBER 28, 1955

REFINING

Fluid coke—newest steam-making fuel
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DRILLING

Most distant offshore drilling platform
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PIPELINES

Who's using remote control—and how?
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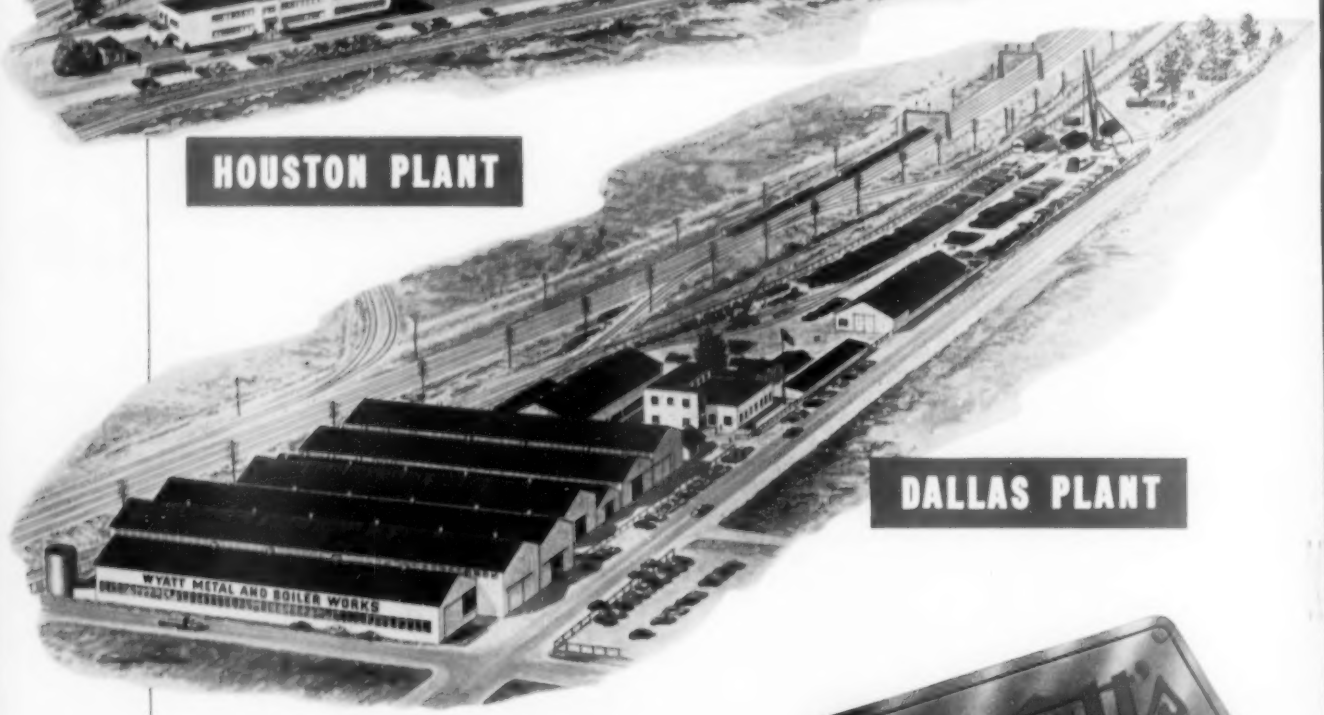
Million-barrel-daily flood proposed to stop Long Beach sinking. p. 48

Wyatt's Workshops

Serve the Fabrication Needs of the Processing Industries

HOUSTON PLANT



DALLAS PLANT

• Steadily since 1913 facilities of Wyatt Metal & Boiler Works have been enlarged so that it can respond to any call from the Refining and the Chemical Industries.

Wyatt's
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MANUFACTURERS AND ERECTORS SINCE 1913

A glance ahead . . . at press time

These trends will make TOMORROW'S NEWS

Pick-up in drilling for the tax year has started. Rotary rig count in the Permian Basin area of West Texas and Southeast New Mexico has hit a new high for the year. Total count was 558 November 10. Previous high was 553 on May 10. Holiday seasons have previously been slack periods, but additional wildcatting, development of shallow fields, and deep discoveries have kept work level high.

Distillate fuel oils may soon be made suitable for almost all industrial applications. Tests by one company show that filtration through a rotary vacuum filter, using a precoat of diatomaceous earth, reduces metal content, sediment, and ash to negligible values. Tests by another company show that hydrogen treating of fuel oils can be carried out economically. Still another company has developed improved additives for distillate fuels.

Programs for pipeline construction indicate that mileage laid in 1956 will be close to the capacity of pipe mills. Large gas line projects in Canada, the central part of the United States, and the Rocky Mountain area will take substantial tonnage. By being only 1 day late in placing a firm order, one company failed to get commitment for pipe for a major project planned for next year.

Petrochem shift. With the success of its new film "Mylar" assured, E. I. du Pont de Nemours & Co. is closing its polyethylene film manufacturing facilities. "Mylar" is the film version of "Dacron" synthetic fiber. The film is made from the condensation polymer of ethylene glycol and terephthalic acid. Both of these compounds are petrochemical derivatives. Uses for the new "Mylar" film are for packaging, a developing use for audio-video magnetic tape (for recording both sight and sound), masking and other tapes, electrical applications, metallized film, textile applications, and other uses.

A fracturing fluid of gelled L.P.G. is a new sand carrier being studied by some operators. Features of the gelled hydrocarbon mixture would be fast vaporization and return when the well-bore pressure is released after the treatment. In addition, the L.P.G. would not hamper the movement of formation fluid through the fractures into the well bore, and would actually aid in kicking off the well because of its high vapor pressure and expansion when vaporized. However, a serious problem in applying the method to routine operations is the need of pressure mixing to keep the hydrocarbons liquid and the hazard of fire or explosions should leaks develop in the pressure-mixing system.

Look for the burgeoning Canadian oil industry to achieve its "million-barrel-per-day" production potential well in advance of the original target date of 1960. Some authorities say that developments are coming faster than anyone could have anticipated and that the goal may be reached in 1957.

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY—OPERATION

Fluid Coke—New Fuel for the Steam Industry 75

By F. H. Stracke and F. H. Schiffer

Laboratory and full-scale tests show that the steam industry has a fourth fuel, fluid coke, which can compete with coal, gas, and oil. Article includes results of full-scale combustion tests at Essex station of Public Service Electric & Gas Co., Newark, N. J. Other tests are now under way at several installations, and the results should be available soon.

Signal Uses Package Water Flood Plant 79

By J. L. Eakin

Signal Oil & Gas Co. conducts pilot water-flood operations in Northeast Oklahoma with a package plant designed for portability. Controls are centrally located and large equipment is skid-mounted. This is the first in a series of five articles on water floods in this area.

Here's How That Phillips Offshore Rig Was Erected 80

A step-by-step picture story recording the erection of a big self-contained platform 40 miles from shore and in water 85 ft. deep. Phillips Petroleum Co. is drilling from the man-made island in Block 184, Eugene Island area, off St. Mary Parish, Louisiana.

Diesel-Electric Rig Used on Phillips Offshore Platform 82

By Ed McGhee

Phillips Petroleum Co. is drilling with a diesel-electric rig from a new offshore platform described in the preceding article. This article describes the rig and tells how it and other equipment were assembled for compactness, convenience, and efficiency on a platform 85 by 140 ft.

Pipeliners Like Push-Button Station Control 85

By E. B. Turner

Results of a comprehensive survey of oil pipeline operators show that (1) results with remotely supervised equipment are very good, and (2) use of push-button stations is increasing.

Ammonia from Catformer Tail Gas 90

By J. H. Arnold and W. T. Dixon

A 100-ton per day anhydrous ammonia plant is operating on hydrogen from Catformer tail gas in Atlantic Refining Co.'s Philadelphia refinery. Results from 1½ years of operation are good.

Hydraulic Pumping Systems Solve Dual Zone Problems 98

By D. H. Stormont

This article includes diagrams and discussions of six types of hydraulic pumping systems. These have been developed to solve a wide variety of dual-zone problems.

Save That Production Pumping Power 103

By Roger K. Owen

All-electrified beam pumping units save money. Data from operating leases show that they pay for themselves in less than a year.

On the Job . . . In the Plants 107

Here's a description of an automatic compressor setup especially designed for recovering gasoline vapors during tank truck loading. No manual labor is required in starting and stopping these compressors. Load is entirely controlled by pressure, or vacuum, in the suction and intake manifolds. . . . Easier cleaning of liquid level gages. . . . How to build a salvage press from scrap. . . . Other items.

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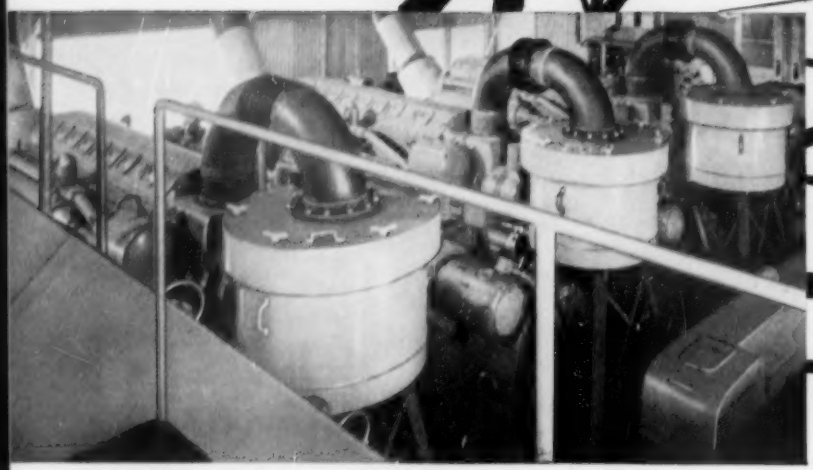

Compact installation of three 7-cylinder Model 38F-90 drilling engines operating compound, giving 1575 continuous rated hp. for pumps and draw works.

From the ground up... an all-duty drilling engine

From block to flywheel the Fairbanks-Morse Model 38F has all the features you expect to find in a rugged, responsive engine for continuous service under the shock and strain of field service. Such as . . .

High Power . . . output for continuous service—at low b.m.e.p. and low piston speed—makes the Model 38F a dependable, low-maintenance power package. Rated speed extends to 1200 rpm. for continuous service, making it ideal for economical application to mechanical compounds, hydraulic couplings, torque converters, electric couplings or full electric drives.

Fast Response . . . is a plus feature of two-cycle design that gives extremely rapid speed acceleration for faster pipe handling and yet is practically vibration free at all operating speeds. And there's instant reserve power in the 38F to handle overloads and emergencies.

Low Maintenance . . . easier inspection and operation are inherent advantages of the Opposed Piston design that eliminates 40% of the moving (wearing) parts found in engines of comparable rating. Liners, pistons and rings are far easier to get at than in an engine where a head—its connections and gasket—has to be removed.

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The arrow is pointing to the Du Pont test car's fuel-injection pump, which is driven by the same shaft as the distributor.

From these tanks in the trunk, any of six different fuels can be selected for testing in the fuel-injection engine.

Fuel-injection car being tested on Du Pont Petroleum Laboratory's chassis dynamometer.

Special Du Pont test car studies advantages of *fuel-injection*

Will fuel-injection soon replace our standard carburetor system? As yet, no one knows the answer! But there are certainly many advantages to recommend it . . . such as freedom from carburetor icing, reduction of vapor lock troubles and improved power. And it will permit automobile styling changes since the hood lines can be lowered.

But how would a trend to fuel-injection engines affect the refiner? As a large supplier of the chemical additives used to improve fuel performance, we at Du Pont are interested in this development. And to study it thoroughly, the Du Pont Petroleum Laboratory is using a specially equipped test car.

The car has a Lincoln V-8 engine to which has been added an American Bosch fuel-injection system and special instrumentation. In addition to road work, the Petroleum Laboratory has tested the car on the Laboratory's chassis dynamometer.

From testing it with a variety of gasoline blends, the Laboratory has found that *fuel-injection permits greater flexibility in blending fuels. Fuel components with higher vapor pressures can be used, and it is possible that increases in the use of higher end point fuels may be practical. These wider tolerances could result in significant economic advantages to refiners,* as well as welcome benefits to the motoring public.

The Du Pont Petroleum Chemicals Division now has this car on a demonstration tour throughout the United States.

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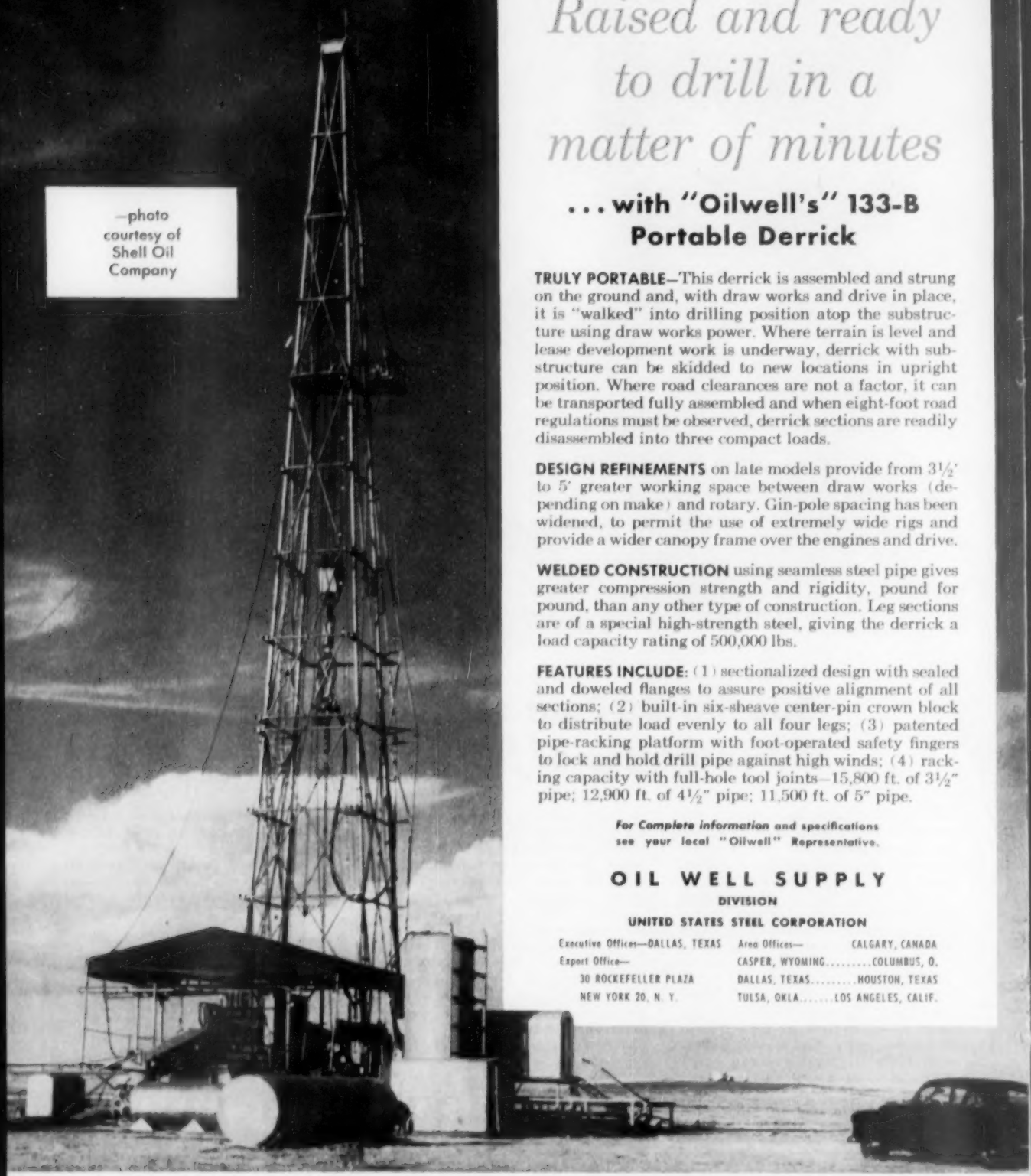

—photo courtesy of Shell Oil Company

Raised and ready to drill in a matter of minutes

. . . with "Oilwell's" 133-B Portable Derrick

TRULY PORTABLE—This derrick is assembled and strung on the ground and, with draw works and drive in place, it is "walked" into drilling position atop the substructure using draw works power. Where terrain is level and lease development work is underway, derrick with substructure can be skidded to new locations in upright position. Where road clearances are not a factor, it can be transported fully assembled and when eight-foot road regulations must be observed, derrick sections are readily disassembled into three compact loads.

DESIGN REFINEMENTS on late models provide from 3½' to 5' greater working space between draw works (depending on make) and rotary. Gin-pole spacing has been widened, to permit the use of extremely wide rigs and provide a wider canopy frame over the engines and drive.

WELDED CONSTRUCTION using seamless steel pipe gives greater compression strength and rigidity, pound for pound, than any other type of construction. Leg sections are of a special high-strength steel, giving the derrick a load capacity rating of 500,000 lbs.

FEATURES INCLUDE: (1) sectionalized design with sealed and doweled flanges to assure positive alignment of all sections; (2) built-in six-sheave center-pin crown block to distribute load evenly to all four legs; (3) patented pipe-racking platform with foot-operated safety fingers to lock and hold drill pipe against high winds; (4) racking capacity with full-hole tool joints—15,800 ft. of 3½" pipe; 12,900 ft. of 4½" pipe; 11,500 ft. of 5" pipe.

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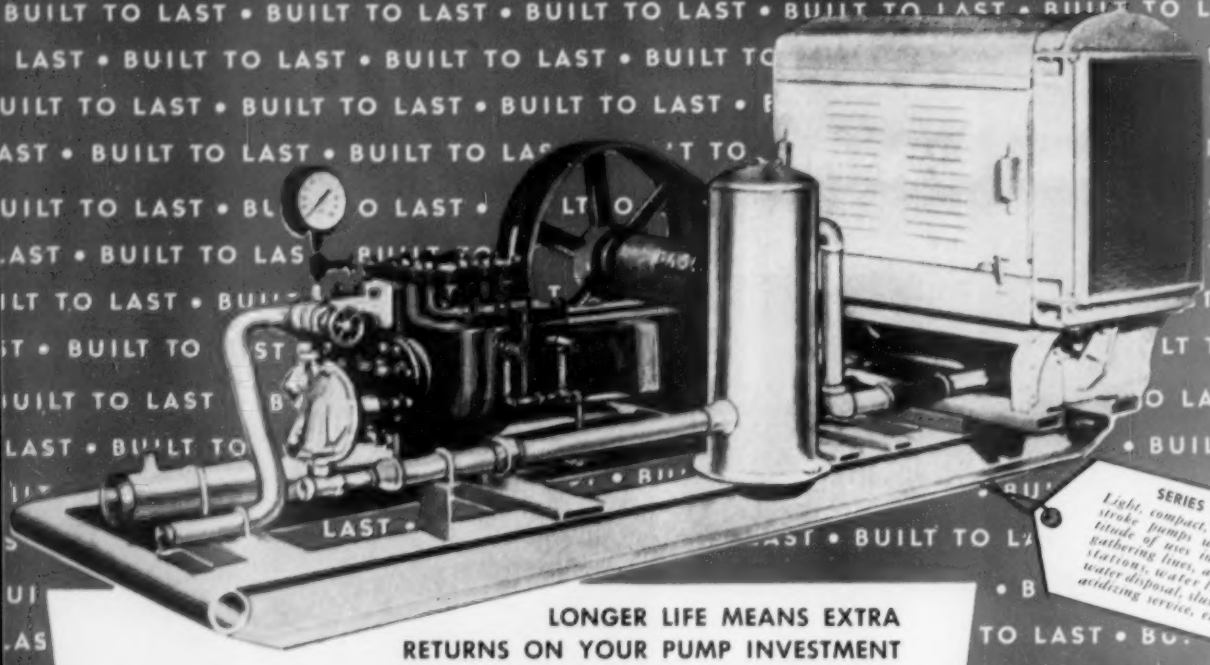

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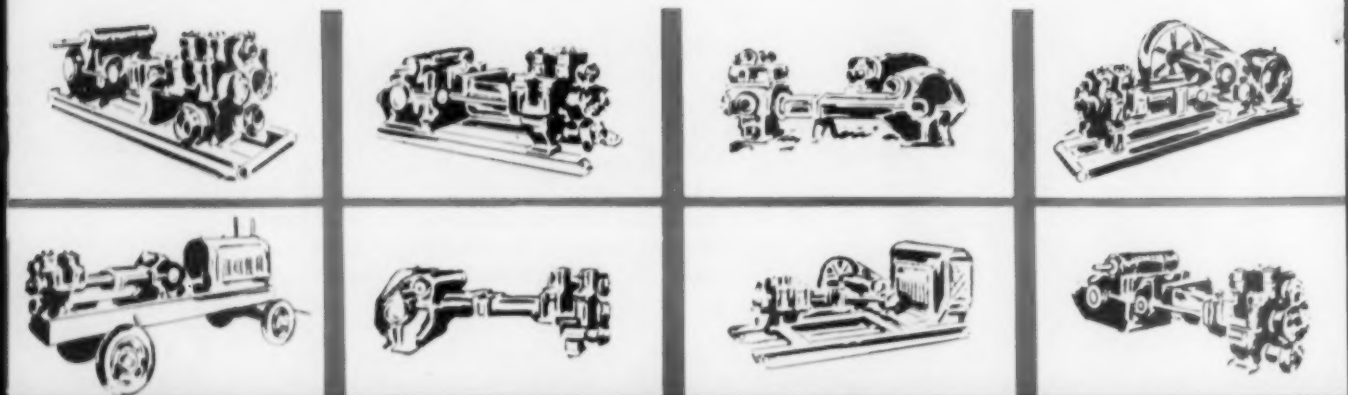

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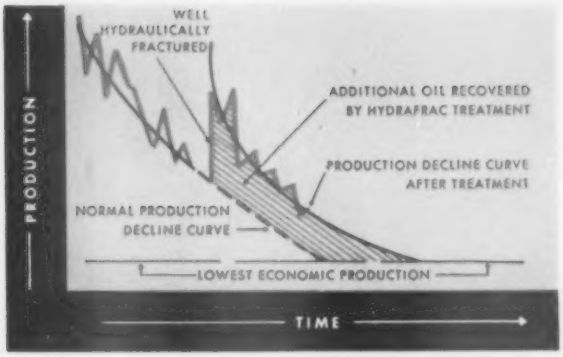

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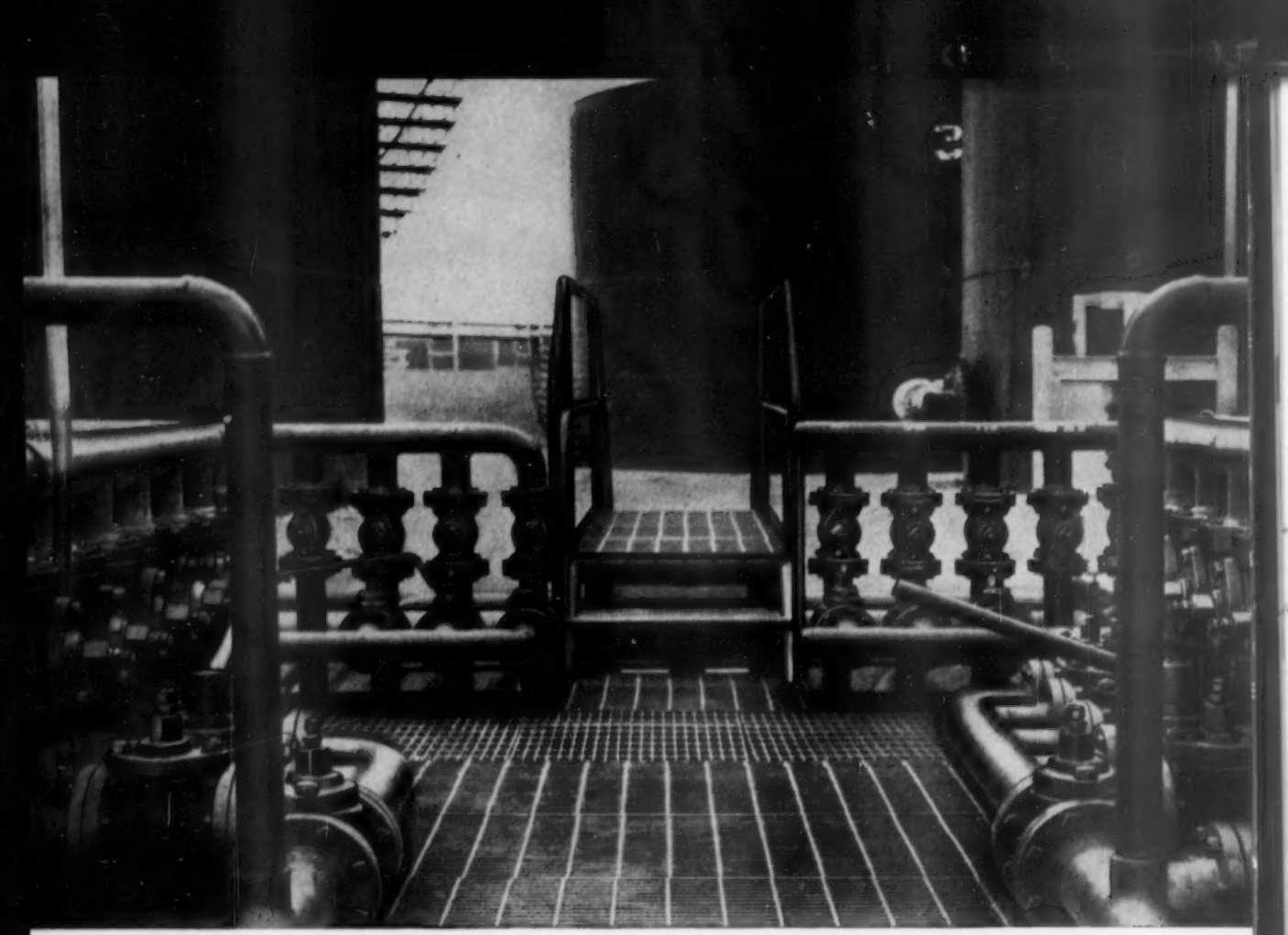

Costs Down... Production Up

because **Rockwell**-Nordstrom **Valves** perform better, longer, for less money!

In key spots, where dependability is vital, you *expect* to see Rockwell-Nordstrom valves. They were created forty years ago for the tough jobs ordinary valves couldn't handle.

But now you also see them—by the hundreds *and thousands*—in "routine" services like the tank manifold shown above, and for the same basic reasons:

—they're ruggedly dependable, yet cost no more than ordinary valves.

—they're pressure-lubricated, to provide a truly tight, dependable seal...

—the lubricant film prevents grinding metal-to-metal wear, means longer life, less downtime, lower maintenance cost...

—quarter-turn, and the hydraulic-jack action of the lubricant, make them quick and easy to operate, once a day or once a year...

Rockwell-Nordstrom is the *original* lubricated plug valve, and for 40 years has been the plug valve leader. That's why Rockwell can give you the most complete range of sizes, pressure-temperature ratings, body designs, and metals.

Why not standardize on Rockwell-Nordstroms—and genuine Rockwell-Nordstrom lubricants—for your fuel, products, supply and transfer lines? You'll get better valve service than you've ever had before, and at lower cost per year. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom **VALVES**

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

Two strings of Bethlehem X Mayari rods, activated by these Bethlehem pumping units, pump from two formations within one string of casing. Well is operated by Stanolind Oil and Gas Company.

Two Wells In One

You don't find this type of well every day—a dual well, equipped with two pumping units, pumping from two different formations, yet within the one string of 7-in. OD casing. It is Well No. 15 of the Virginia Banks Lease, and is operated near County Line, Okla., by Stanolind Oil and Gas Company.

The installation consists of two strings each of 2-in. EUE tubing and Bethlehem ¾-in. Sucker Rods, operating within one string of 7-in. OD casing. A bottom-hole pump is set in each formation. A special packer is set about midway between the two producing zones. The tubing in the lower zone is run through the packer.

The well, with its two strings totaling nearly 10,000 ft of Bethlehem ¾-in. X Mayari Sucker Rods, was put on pump in June, 1954. The larger of the pumping units, a Bethlehem 228D-20S, produces 30 bpd of 24 specific gravity oil from 5000 ft. The smaller unit, a Bethlehem 114D-14SA, produces 11 bpd of 34 specific gravity oil from 4360 ft.

The Bethlehem X Mayari Sucker Rod is one of five types of carbon and alloy rods produced by Bethlehem to help you obtain maximum pumping efficiency. If you have any question about which rod would be best for a particular pumping operation, get in touch with your Bethlehem sucker-rod distributor, or drop a line to us at Bethlehem, Pa.

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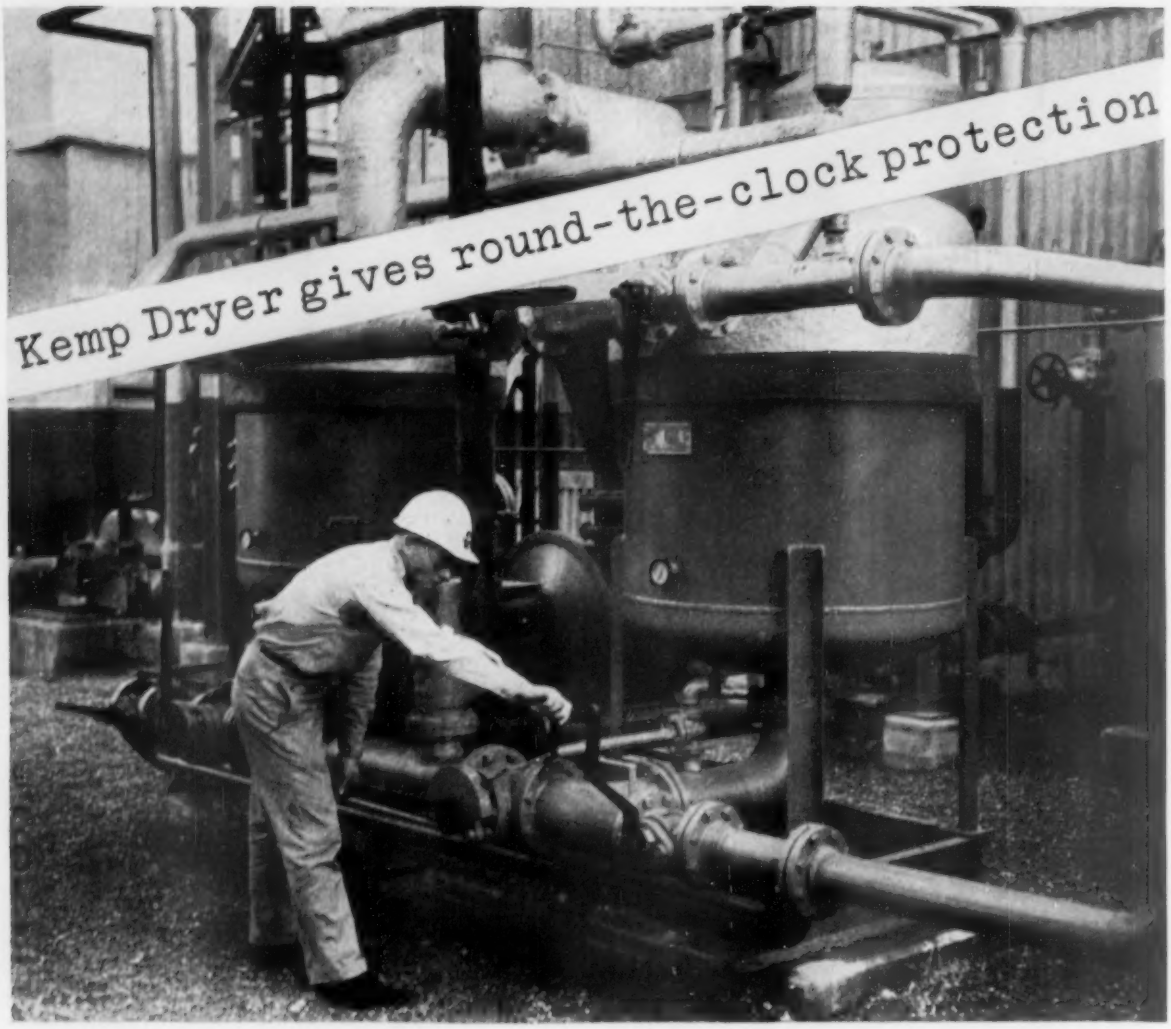

Grace Chemical Company Reports: *Kemp Dryer safeguards instruments throughout plant 24 hours per day*

The Grace Chemical Co. manufactures Anhydrous Ammonia and Urea 24 hours a day at Woodstock, Tenn. This operation demands instrument accuracy with a minimum of maintenance and downtime. To increase instrument efficiency by preventing corrosion and costly line freezes, Grace Chemical installed a Kemp Dryer.

Kemp Requires Little Attention

Semi-automatic, the Kemp Dryer works night and day drying compressed air for instruments and pneumatic controlled valves. According to operator Charles Lewis, the Kemp unit requires a bare minimum of attention.

Kemp Dryers for Every Purpose

Kemp offers a variety of dryer models to meet all problems. Designed to dry air, gases or liquids to sub-zero dew points at a low cost, they are constructed of quality materials and embody the engineering knowledge gained from Kemp's many years of experience. Kemp Dryers are available with manual, semi-automatic, or fully automatic tower reactivation. In addition, Kemp will prescribe the proper desiccant for each drying job. If you have a problem involving the removal of water from air, gases, or liquids, contact Kemp engineers now. For complete facts and technical information, write for Bulletin D-27.

KEMP
OF BALTIMORE

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CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • INERT GAS GENERATORS
SINGEING EQUIPMENT

THE C. M. KEMP MFG. CO.
405 East Oliver Street, Baltimore 2, Maryland

Why more LINK-BELT API (SS type) chain is used than any other brand

CADMIUM-PLATED PINS

The finish on these pins prevents rust, avoids corrosive fatigue in these flexing members. Link-Belt chain pins go into service in factory-finish condition no matter how long they've been stored.

It's built and packaged for the toughest jobs. And it's available at leading supply stores . . . everywhere!

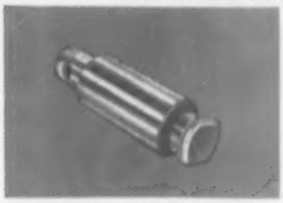
YES — from every angle — Link-Belt's API chain (SS type) leads the field. Starting in with the manufacture, Link-Belt takes extra steps to assure longer chain life. And these "extras"—like the ones shown here—are *standard* on every length of Link-Belt API.

In packaging, too, Link-Belt gives you more value. Steel-banded *double* box keeps out even the finest sand . . . stands up in the wettest weather without wilting.

As for availability, you'll find Link-Belt chain at leading supply stores in your field. And Link-Belt warehouses back them up to serve drillers promptly . . . *everywhere.*

Book 2580 gives complete information on Link-Belt's quality equipment for the oil fields. Ask for a copy today.

FOUR OF MANY "EXTRAS" YOU GET AS STANDARD ON LINK-BELT API CHAIN



GRINDING pins *and* bushings (all contact surfaces) to a fine micro-inch finish eliminates wear-producing surface irregularities.

SHOT-PEENED rollers have been hammered by tiny steel balls—creating added ability to withstand shock and impact.

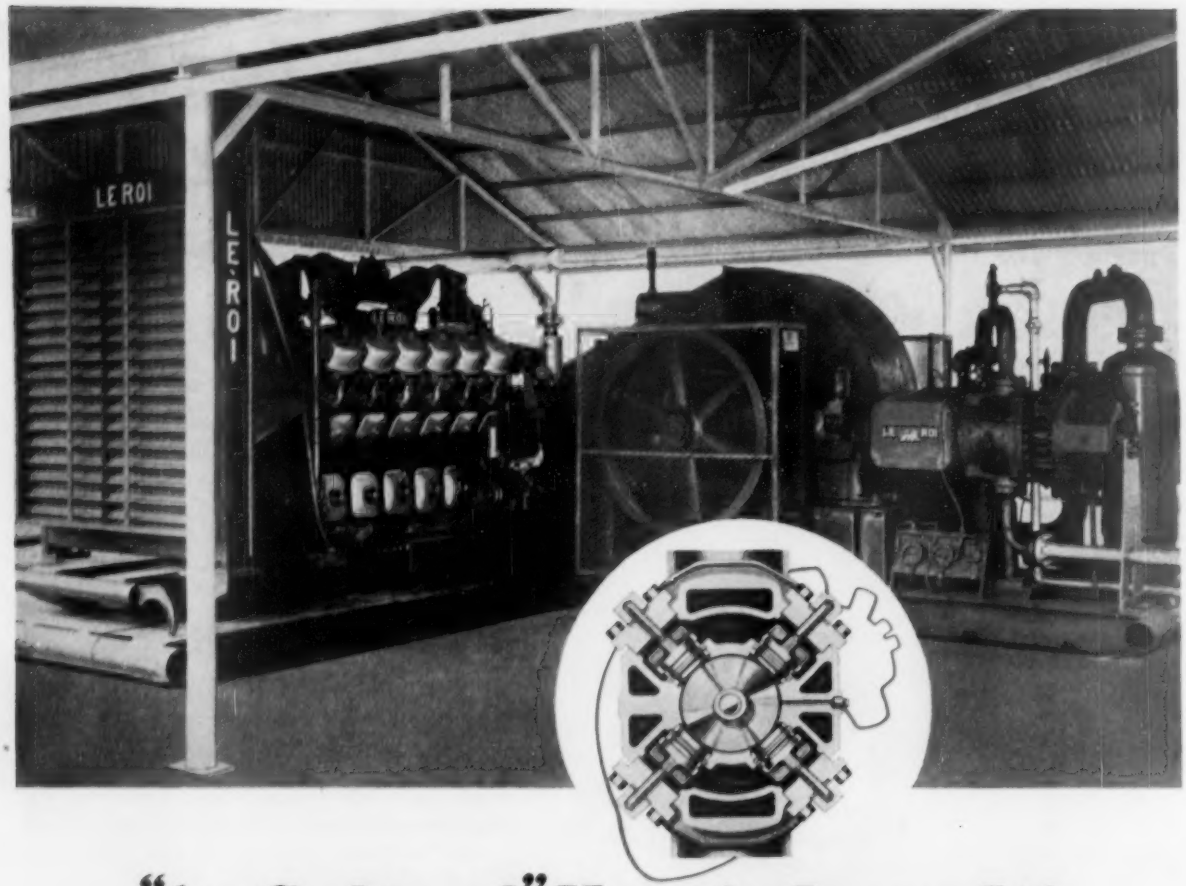
COTTERS have patented grooved shank affording tight fit in pin hole. Yet pin is easily removed or inserted. Cadmium plated.

MORE CONVENIENT, TOO! Link-Belt packs its oil field chain in dustproof, sturdy boxes for easy handling, quick identification.

LINK-BELT

CHAINS and SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 15); Export Office, New York 7. Distributors in All Fields.



"Air-Cushioned" Heart for Longer Life*

. . . that's why Le Roi Gas-Booster Compressors cost less to own and operate

VALVES are the heart of a compressor. That's why Le Roi "Air-Cushioned" the valves of its gas-booster compressors. This feature makes a lot of difference — money-saving difference, because "Air-Cushioned" valves have longer life, and more efficiency. Moreover, they are quieter and more dependable.

Of simple design, "Air-Cushioned" valves in Le Roi gas-booster compressors have no unneeded parts—nothing to break easily or get out of order. The valve discs are not subjected to flexing or bending strains to weaken or distort them, because they are unrestricted in movement. Through long periods of service, "Air-Cushioned" valves remain perfectly flat and tight-seated.

Le Roi gas-booster compressors have many other features that provide easy servicing, easy portability, and longer life. They have a sectionalized gas-compressor cylinder that can be disassembled without disturbing gas-pipe connections. The intake is at the top and the discharge at the bottom for self-scavenging of any condensate. Intake and discharge valves are interchangeable and can be assembled and disassembled with only a screwdriver.

In addition, Le Roi gas-booster compressors are equipped with safety controls that stop the unit if safe conditions are not met. This prevents costly damage to both the compressor and the engine.

Le Roi gas-booster compressors are available in a size range from 10 to 300 hp in five, seven, nine, eleven and thirteen-inch stroke machines—and they're powered by Le Roi engines.

Get full information on the size unit best suited to your requirements.

Write Le Roi Oilfield Headquarters, 5000 45th West Avenue, P. O. Box 9378, Tulsa, Oklahoma.

* "Air-Cushioned" is a trade name

LE ROI *Division of Westinghouse Air Brake Co.*

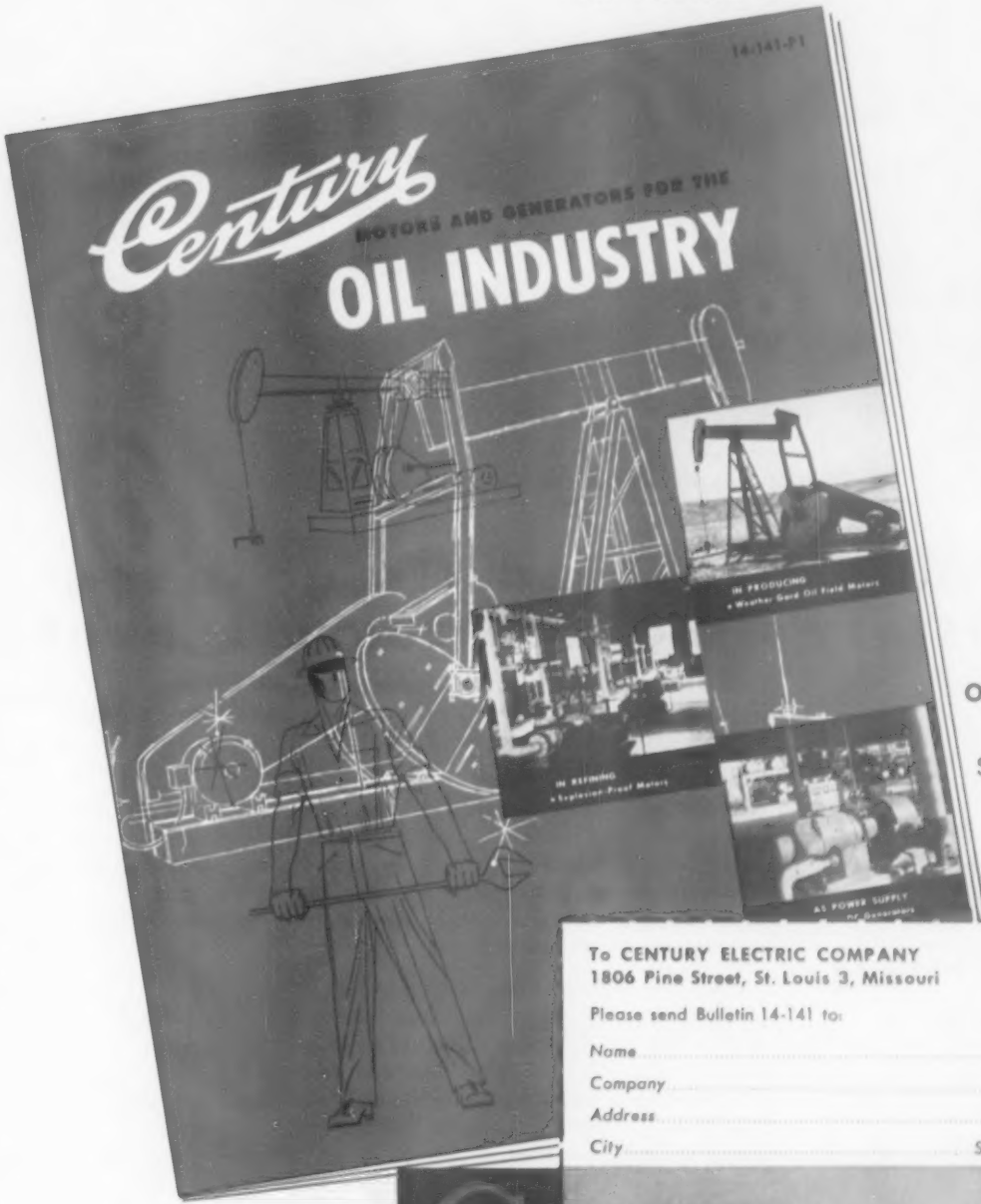
Milwaukee 1, Wisconsin

P-142

PORTABLE AIR COMPRESSORS · TRACTAIR · STATIONARY AIR COMPRESSORS · AIR TOOLS · ENGINES

Choose your motors scientifically...
FOR LONGER, SAFER SERVICE!

Read this new Century bulletin written specially for oilmen... in the field and in refineries



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"Million-dollar chunk of steel" being floated to offshore position, where it will be settled on the bottom by filling the pontoons with water

Sheffield Steel products "go to sea" in history's biggest treasure hunt

Talk about sunken treasure! Under the coastal waters of Texas and Louisiana lie oil pools estimated at nearly half the total of recoverable reserves in the U. S.

Sheffield was ready when the Tidelands Bill gave the treasure hunt signal. Ready with steel for building the drilling platforms – man-made "islands" as far as 30 miles at sea. Ready with bolt and nut products; high-strength structural bolts; structural steel and merchant shapes; plates for barges and pontoons; and numerous other steel items which implement the big search for new oil.

Big as it is already, offshore oil production is barely out of the pioneering stage. Its future is tremendous. Sheffield is geared to produce the steel that's needed. If you're in any part of the oil business, you have an interest in knowing how Sheffield quality steel and Sheffield's strategic location provide important advantages. Get the facts from your nearest Sheffield office.

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ARMCO

Quality Steel for the oil industry

SHEFFIELD STEEL

DIVISION

ARMCO STEEL CORPORATION

SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA

Get an OVERLOAD RELIEF VALVE

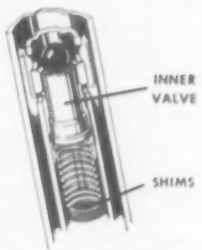
with your GUIBERSON TUBING SWAB

HEAVY DUTY TYPE SR RELIEF VALVE ON GUIBERSON TUBING SWAB

The Guiberson Overload Relief Valve will pay for itself many times over in preventing stuck swabs—in saving your wire line—because it automatically dumps excess fluid, lets you pull up the right amount of fluid for your swab job. It is well worth the slight extra cost.

The relief valve takes the place of the regular swab valve body and may easily be installed in the field on any Guiberson Tubing Swab. Valve is factory set to support a predetermined column of fluid and is responsive only to fluid pressure (fluid column) and not to line load. Parts subject to wear by high velocity fluid are corrosion resistant and long-lived.

For the best swab job — save your time and money with the Guiberson Tubing Swab. In 1½", 2", 2½", 2⅞", 3" and 3½" sizes, with cups for every size and purpose. Swabs also available for all drill pipe and casing sizes.



OVERLOAD RELIEF VALVE is easily adjusted in the field to support more or less fluid by changing number or thickness of shims under spring.

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Hydreco Gear Type Pump and Dudco Dual Vane Fluid Motor.

Petroleum Production Moves Forward with Power FLUID POWER

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Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

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WATERTOWN DIVISION
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Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

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Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

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Liquid Handling Pumps, Centrifugals and deep well Turbines, 7000 gpm, 500 ft. heads. Turbine-type, 150 gpm, 600 ft. heads. Condensate Return Units.

Time schedules for modern exploration, drilling, production and pipe line operation leave no room for equipment that does not best combine Safety, Flexibility, Speed and Economy. Thus, Fluid Power gets the call to provide thrust or rotary motion for drill rigs, rotary tables and winches . . . for drives and controls on portable equipment and vehicles . . . for power to drive pumps, generators, mixers and actuate valves along pipe lines.

The DUDCO and HYDRECO Divisions of The New York Air Brake Company produce components for improved hydraulic circuits for all types of field and production equipment. For 1000/1500 psi operation, the HYDRECO Division furnishes Gear Type Pumps and Motors as well as Control and Auxiliary Valves and Hydraulic Cylinders.

The DUDCO Division provides Dual-Vane Pumps and Motors for 2000 psi circuits and 5000 psi Variable Delivery Pumps for special high pressure applications.

In addition to this advanced type Hydraulic equipment, The New York Air Brake Company contributes a broad range of Liquid Handling Pumps and world-famous Kinney High Vacuum Pumps to Petroleum production. Here, for the oil man to choose, are Aurora Turbine and Centrifugal Pumps and Kinney Heliquad Gear and Rotating Plunger Pumps . . . equipment to solve the problems of "pumping any substance that will flow through a pipe." And, for de-aerating, dehydration, vacuum distillation, refrigeration and other petro-chemical processes . . . Kinney Vacuum Pumps.

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THE NEW YORK AIR BRAKE COMPANY

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INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

Enough to run a pipe line from San Francisco to London

THE gas and petroleum transmission industries can take great pride in the gigantic jobs they've completed in recent years.

As a major supplier of large diameter steel line pipe, Kaiser Steel has been privileged to play an important part in these vast undertakings. In five years, enough line pipe of various diameters has been shipped from our Napa, California plant to run a pipe line from San Francisco to London.

Shown below is a partial list of major customers, who have used Kaiser Steel Line Pipe in scattered locations from New York to California, from Canada to Mexico.

CITIES SERVICE GAS CO.
NORTHERN NATURAL GAS COMPANY
PANHANDLE EASTERN PIPE LINE CO.
SINCLAIR PIPE LINE CO.
INTERPROVINCIAL PIPE LINE CO.
OKLAHOMA NATURAL GAS CO.
PLATTE PIPE LINE CO.
NATURAL GAS PRODUCERS, INC.
THE MONTANA POWER COMPANY
COLORADO INTERSTATE GAS CO.
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MOUNTAIN FUEL SUPPLY CO.
SOUTHERN UNION GAS CO.
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PACIFIC GAS & ELECTRIC CO.
STANDARD OIL COMPANY OF CALIFORNIA
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RICHFIELD OIL CORPORATION
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Kaiser Steel

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THE TEXAS PIPE LINE COMPANY
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TRANSCONTINENTAL GAS PIPE LINE CORP.
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Prompt, dependable delivery at competitive prices • **KAISER STEEL CORPORATION** Los Angeles, Oakland, Seattle, Portland, Phoenix, Denver, Tulsa, New York

Have You a High Pressure Gas Well?

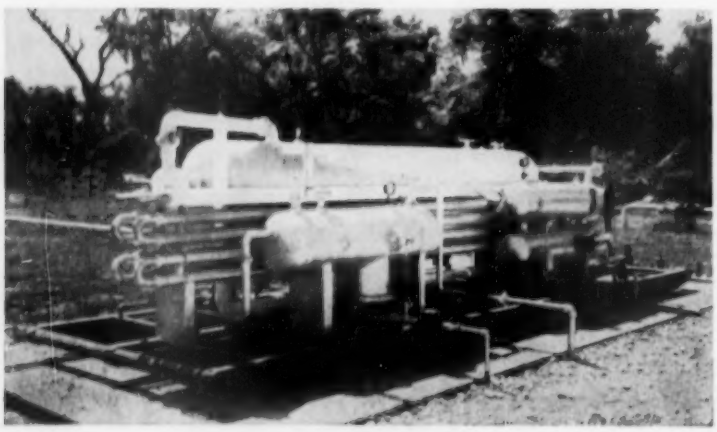
M-C Dricold Can Help You . . .

WRING THE DISTILLATE OUT and **DRY THE WATER OUT**

Up to 30% Higher Distillate

Recovery with a Maloney-Crawford

PACKAGED COLD SEPARATOR



The Maloney-Crawford "Dricold" unit is a carefully engineered and precisely built skid-mounted cold separator. Distillate recovery from high pressure gas wells can often be increased as much as 30 percent over conventional two stage separation by producing through the Dricold Unit.

Very low water dew points are obtained through the unit, even when the available pressure drop is so low as to be considered marginal for other cold separators.

The finest available controls and accessory equipment are standard on the Dricold unit—to reduce your maintenance costs and down-time. Units are available in capacity ranges up to 15 million cubic feet a day.

Let a M-C representative show you how Dricold can meet your needs.

MALONEY-CRAWFORD TANK & MFG. CO.

MALONEY-CRAWFORD TANK AND MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma.
EXPORT REPRESENTATIVE: Baird Lines—420 Lexington Avenue—New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd.—Edmonton
TEXAS PANHANDE REPRESENTATIVE: Atlas Tank Company—Pampa, Texas.

How to get more for your dollar in stainless steel fittings!

When you specify TUBE-TURN* Welding Fittings and Flanges . . . regardless of type, size or material . . . you can be *sure* you are getting *top value.* Manufacturing improvements which we are constantly making assure not only unsurpassed quality, but economies which are passed on to you.

In TUBE-TURN Stainless Steel Welding Fittings, for example:

Recent advancements in our production techniques have netted important savings, resulting in price reductions. Are you taking advantage of these savings . . . plus the extra values described on the next page?

TUBE-TURN Welding Fittings and Flanges are made in U.S.A.
They meet *all* U.S. piping code specifications.

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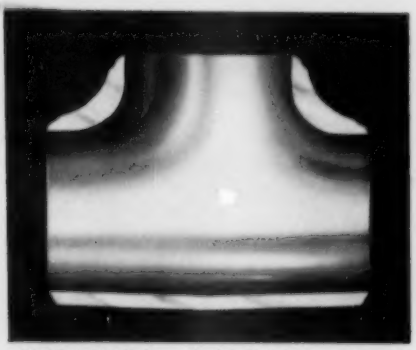
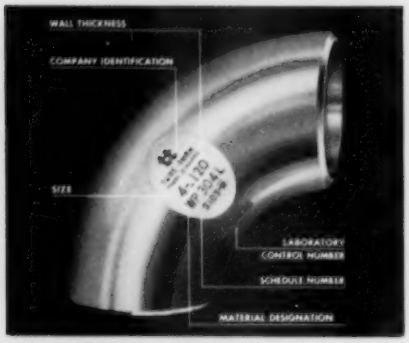
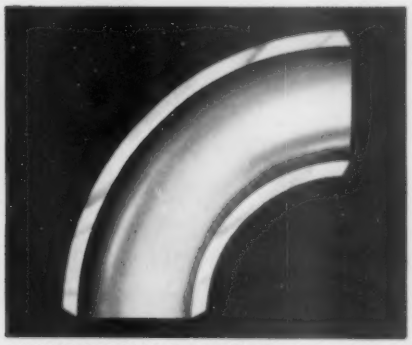
EXTRA VALUES



MATCH PIPE for calculated bursting strength.



LONG-LASTING IDENTIFICATION. Lectro-etch markings give complete, permanent information. Fittings have bright, attractive finish.



UNIFORM WALL THICKNESS. Pipe minimum wall thickness tolerance of 87½% of nominal thickness is maintained.

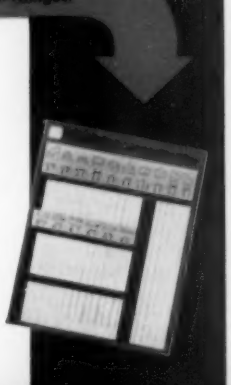
TUBE-TURN*

Stainless Steel Welding Fittings and Flanges offer you these extra values

MEET ALL CODES: ASTM A312 (for material); MSS SP43 and ASA B16.9 (for dimensions); MSS SP25 (marking procedure).

COMPLETE LINE IN STOCK . . . four analyses: Type 304, 304L, 347 and 316. Four wall thicknesses: Schedules 5S, 10S, 40S, 80S.

WALL CHART of dimensions of popular sizes of TUBE-TURN stainless steel Welding Fittings and Flanges.



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TUBE TURNS

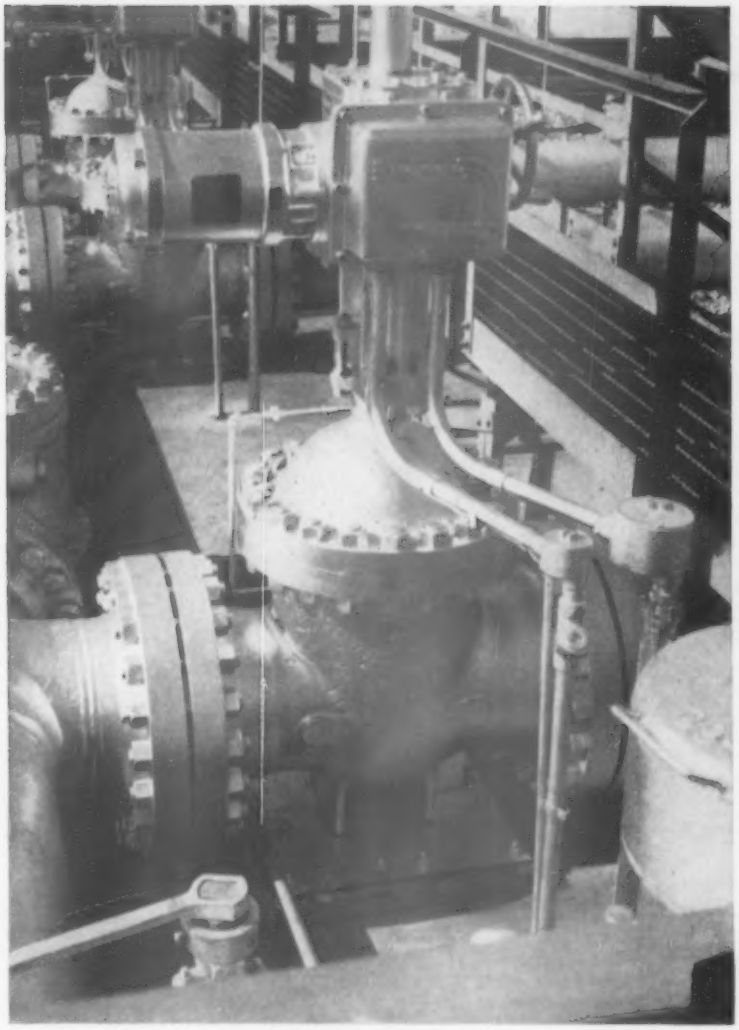
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

LOUISVILLE 1, KENTUCKY

DARLING VALVES

How they cut down time in pipe line service . . .

with DARLING Revolving Disc GATE VALVES



Electrically operated 16" x 12" x 16" venturi-type Darling fully revolving double disc parallel seat *gate valves on a main line station.*

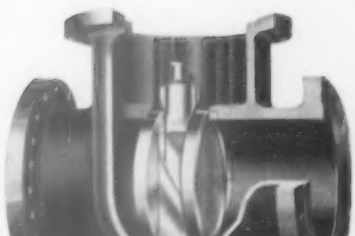
"What a difference!" . . . That's an expression often heard after Darling *fully revolving double disc parallel seat* gate valves go on the job.

In applications like this, these unique Darling valves show off their advantages well.

For example, Darling revolving disc gate valves successfully compensate for valve body distortion . . . they close tight every time! In addition, wear on discs and seats is *uniform.* These important parts just naturally last longer. After years of trouble-free operation should it become necessary to service the valves, the four working parts can be replaced on the spot . . . without removing the valves from the line.

GET ALL THE FACTS

Darling valve users are our best salesmen . . . we invite you to check with them. In the meantime let us send you a descriptive bulletin giving cost-saving facts. Just outline your specific service needs. State whether you are interested in main line, gathering, tank farm or other gas and oil line service. Darling valves can save you a lot of costly, time-wasting valve trouble in the future.



Cutaway showing complete simplicity of the Darling fully revolving double disc parallel seat *cast steel gate valve. Notice the four working parts . . . two interchangeable, no-pocket discs and two husky wedges. Maintenance is easy, assembly foolproof.*

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Now available on

Hydrostart

IF you're running a General Motors Detroit Diesel far from civilization—or in extremely cold weather—here's a new low-cost hydraulic starting system that insures fast starts every time.

This Aeroproducts Hydrostarter spins a Diesel fast, has no parts or components that require regular replacement, costs less to maintain than electric starting systems.

It sells for a lower price than any other nonelectric Diesel starter.

And it's available today from your General Motors Diesel distributor.

EASY TO INSTALL SIMPLE TO MAINTAIN

Your GM Diesel distributor or dealer can quickly install the Hydrostarter on your Detroit Diesel engines. The system is simple. All it takes is a few hours' time for installation, and arrangement of some of the components is optional.

With a Hydrostarter on your Detroit Diesel you'll free yourself from the usual starting problems. The system is completely self-contained—normal routine maintenance checks are all the care it ever needs.

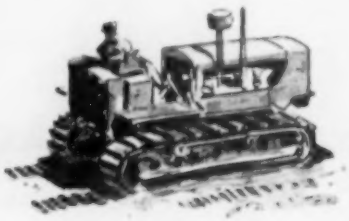
HOW IT WORKS

Heart of the system is a hydraulic starting motor operated by oil under high pressure. An engine-driven pump builds up and maintains pressure in a piston-type accumulator.

To start a General Motors Diesel equipped with a Hydrostarter, the operator opens a simple control lever to admit this oil to the motor which spins the engine. The control lever also completely engages the starting motor's gears with the flywheel before operation.

Your mechanics will get good use from the hand-operated pump which can be used to rotate the engine's flywheel slowly for timing adjustments. This pump can also be used to raise pressure if needed. The oil supply is stored and filtered in a reservoir.

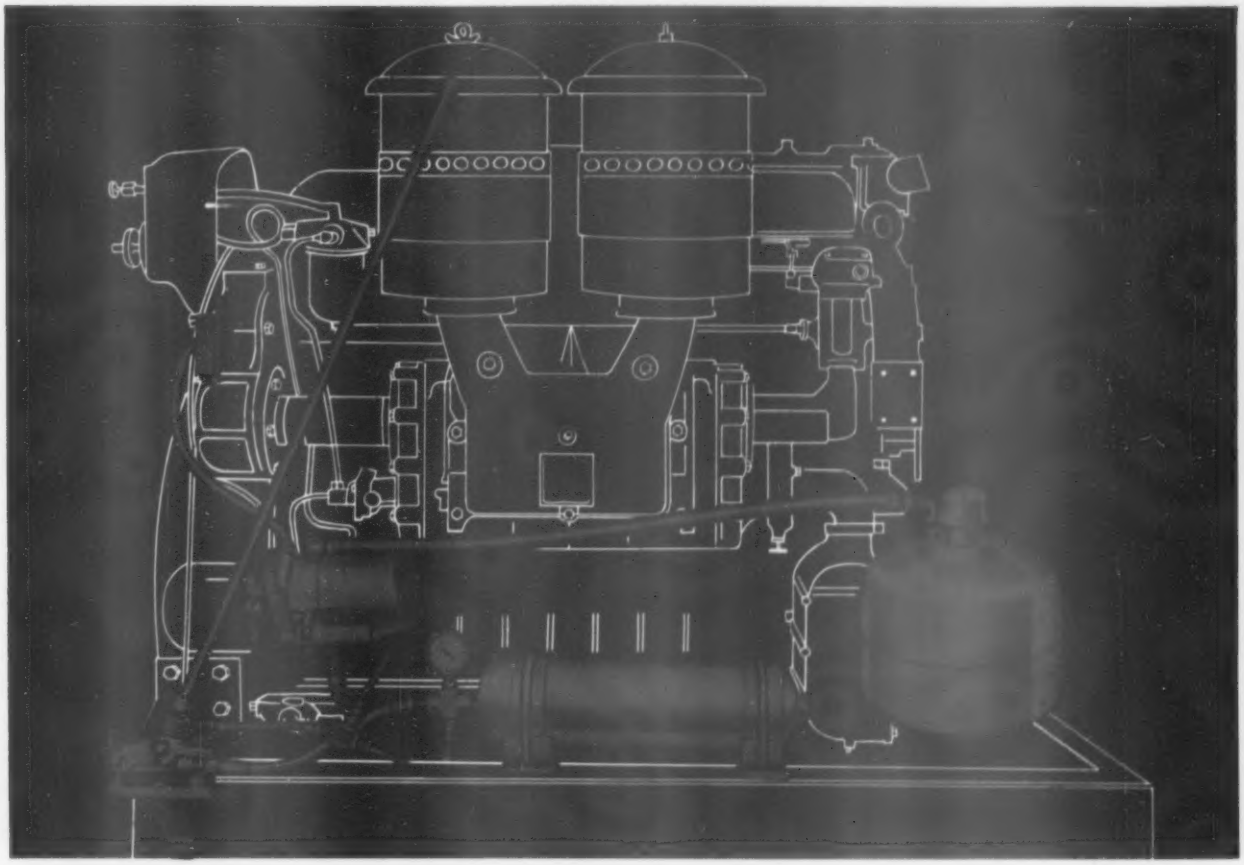
Right now—before winter sets in with a vengeance—is the time to see your GM Diesel distributor about the new Hydrostarter. He can quickly install this new starting system on your Detroit Diesel engines—or can give you full information on the new Hydrostarter.



Detroit Diesel Engines—

er

NEW LOW-COST HYDRAULIC STARTING SYSTEM



DETROIT DIESEL

ENGINE DIVISION OF GENERAL MOTORS

America's Largest Exclusive Builder of Diesel Engines

Single Engines . . . 30 to 300 H. P. Multiple Units . . . Up to 893 H. P.

GM GENERAL MOTORS DIESEL POWER

"It's engineered to get the job done right"

The picture above shows what G. L. Fife, Jr., of G. L. Fife & Son, Natchez, Miss., means when he talks about getting a job "done right." Here, one of their Mack trucks, a six-wheel Model LMSW is moving a draw-works, compound and two motors, a combined weight of approximately 80,000 pounds.

A user of Mack trucks for the past nine years, Mr. Fife says, "I like the way our Mack LMSW eases the iron up a ramp with power to spare. Then when it gets out on the highway it operates at legal road speeds without burning up the rear end gears. It's easy to maneuver and it's dependable. In short, it's engineered to get the job done right."

Bigger drilling rigs and bigger oil field equipment are making extra demands on trucks these days. Trucking contractors in the oil fields, like G. L. Fife & Son, are proving the truth of the oft-repeated fact—Wherever You See Tough Jobs—There You'll See Macks.

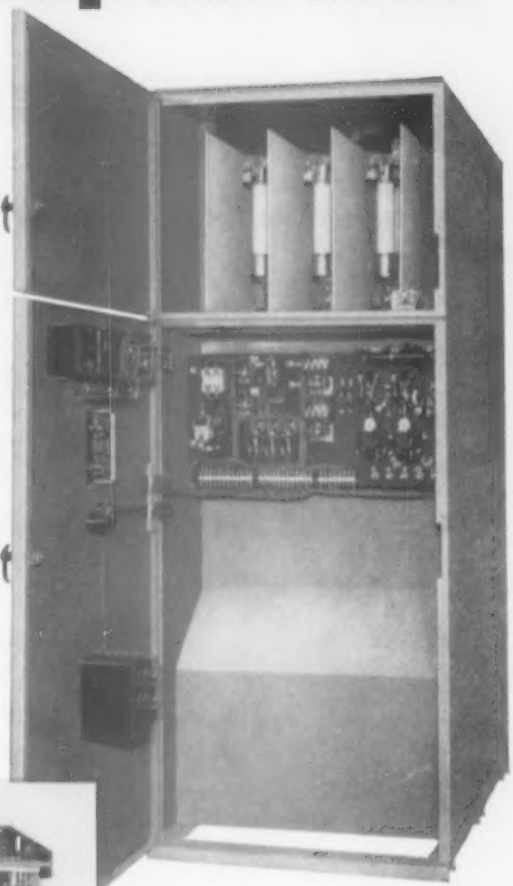
They find that to get the job done right, they can't afford *not* to own Macks.

MACK TRUCKS, Empire State Building, New York 1, N. Y.

3000

Complete "Line-to-Load" MOTOR *Control and Protection* in ONE Compact Unit

ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS



THE Allis-Chalmers Type H high voltage starter is a complete control unit. Everything needed for efficient motor control and positive protection is engineered into one easy-to-install cubicle.

Control functions, varying with specific job applications, include full or reduced-voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.

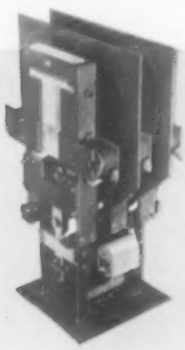
A few of the many protective features

Current-Limiting Fuses clear short circuit in less than ½ cycle . . . long before short can damage contactor or motor.

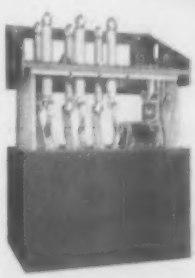
Overload Thermal Relay adjusts for ambient temperatures . . . trips only on motor overload. Allows use of maximum capacity.

Time-Delay Undervoltage Relay permits restarting if power is restored within its setting.

Compartmented Enclosures isolate high voltages. Dead front construction and electrical interlock on fuse compartment provide additional personnel protection.



Choice of Air or Oil Contactors



For complete information, see your Allis-Chalmers representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 14B6410B.

A-4580

ALLIS-CHALMERS

Make determinations in 3 to 4 minutes with the

CENCO coulometric mercaptan titrator

Here's a dependable instrument that provides a rapid, routine method of measuring mercaptans and H_2S in hydro-carbons. It's simple to operate . . . requires no standard solutions . . . measures thiols as low as 100 micrograms. From 15 to 20 consecutive analyses can be run without instrument adjustment. Reaction time registers in tenths of seconds directly on the titrator. Average determination time is 3 to 4 minutes depending upon the amount of mercaptan present.

Overall size 12″ x 12″ x 4½″. Operates from 115 volt, 60 cycle power supply. Licensed under patent rights of Standard Oil Company (Indiana).

No. 20930 Cenco Coulometric Tritator complete, **$549.00.**

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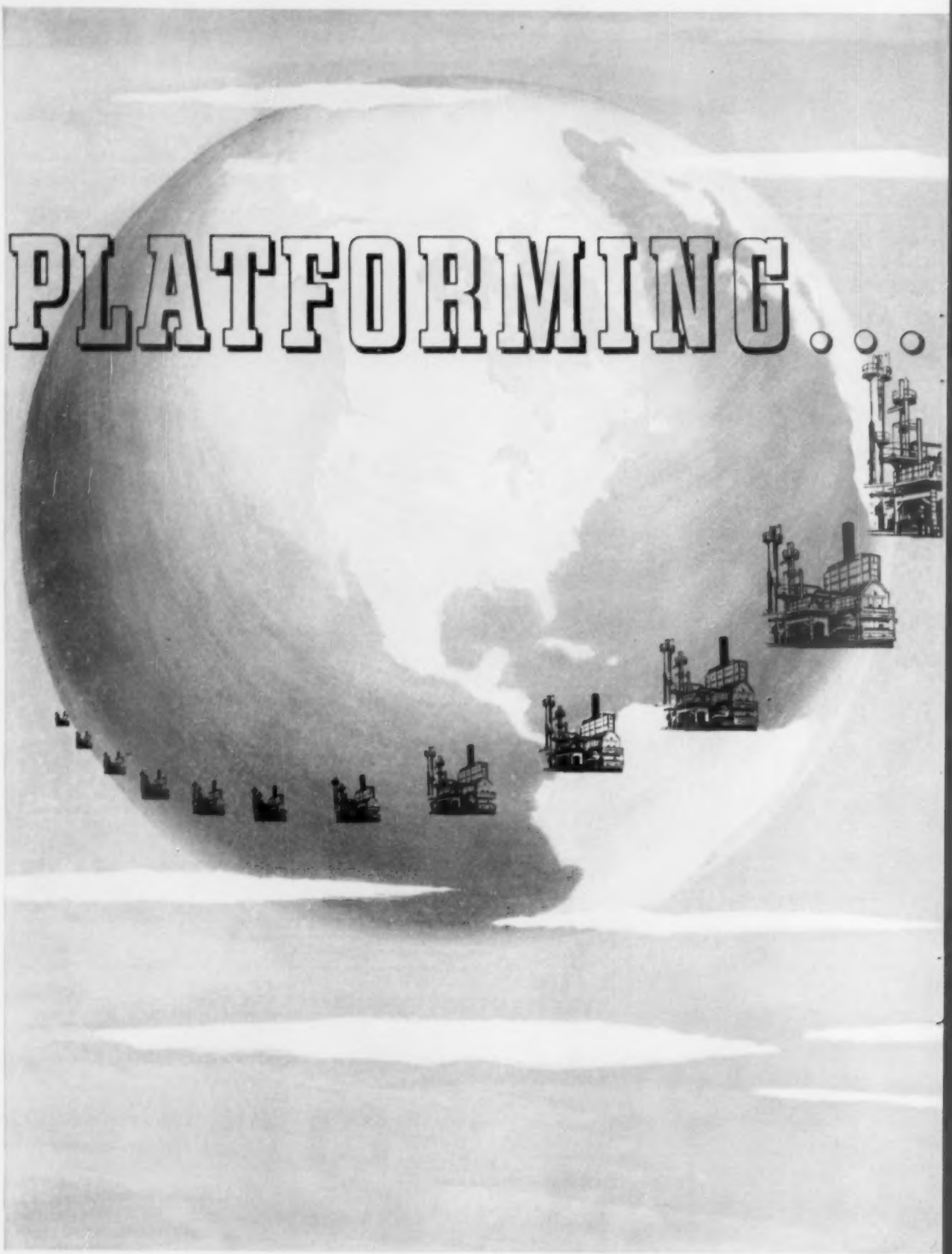
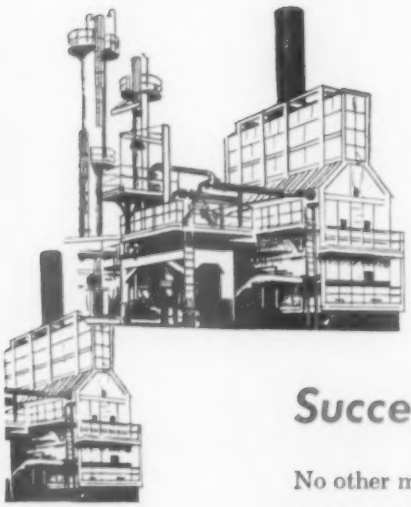

PLATFORMING...



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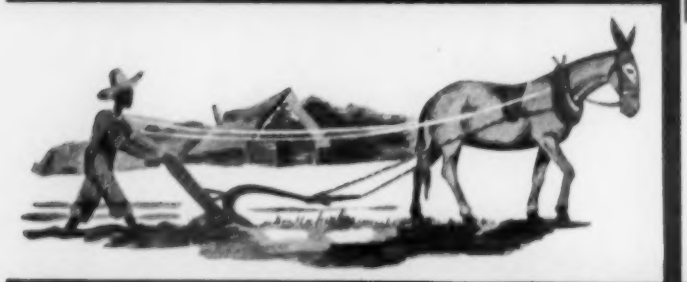

PLOWS AND PRODUCTION

Agriculture began to make real progress when the steel plow replaced earlier devices. The modern version of the plow has made ours the best fed nation on earth.

The advent and evolution of the individual pumping units for oil wells is another typical example of American ingenuity.

Leading in this latter field of progress is the CABOT PUMPING UNIT. The patented rubber bearing between the pitmans and the walking beam requires no lubrication, absorbs vibration, and smooths off the peaks of the polish rod load. The cranks are adjustable in a few minutes by one man.

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They Say—

Imports Curb Questioned

"Dear Sir:

"The proposal to restrict Middle-East oil imports is based upon the notion that this hemisphere will have more oil and more oil-producing facilities at its command in time of war in proportion as its peacetime rate of use is increased.

"This may seem paradoxical to the layman, who thinks of oil as an exhaustible resource, irreplaceable once it is used up. But there is a respectable body of professional opinion which looks on the Western Hemisphere's oil resources as a cornucopia, providing more if we demand more, world without end.

"This theory would seem patently absurd if our conservationists and public-minded geologists had not been consistently wrong over the years . . . But one day the conservationists are bound to be right. One wonders what Mr. Flemming's evidence may be that they will not be right within the next generation.

"Whether Mr. Flemming is right or wrong in supporting the cornucopia theory, his inference that the United States defense should first of all be directed to building up the Western Hemisphere is one to give pause. The United States Government has devoted much of its diplomatic skill to building up a series of defense rings in the Middle East . . . .

"At the moment the chain is being weakened by the Soviet bloc's assiduous offers of arms, street paving and steel mills to nations in the area and we in turn are wondering how to fight back.

"Mr. Flemming's proposals are surely no help at this juncture. His demands could easily be construed as a clear announcement that we do not really expect to hold and use the areas of the Middle East in time of war, but anticipate instead that we will have to fall back on a Western Hemisphere defense . . . .

"But let us assume that Mr. Flemming is right; that at the bitter end the Western Hemisphere is where we can expect to make our stand. Then surely he should have the courage of his contentious convictions and should recommend that the President apply the restrictions on imports which the Trade Agreements Act authorizes.

"Instead, supported by the Cabinet, he has called repeatedly upon the lead-

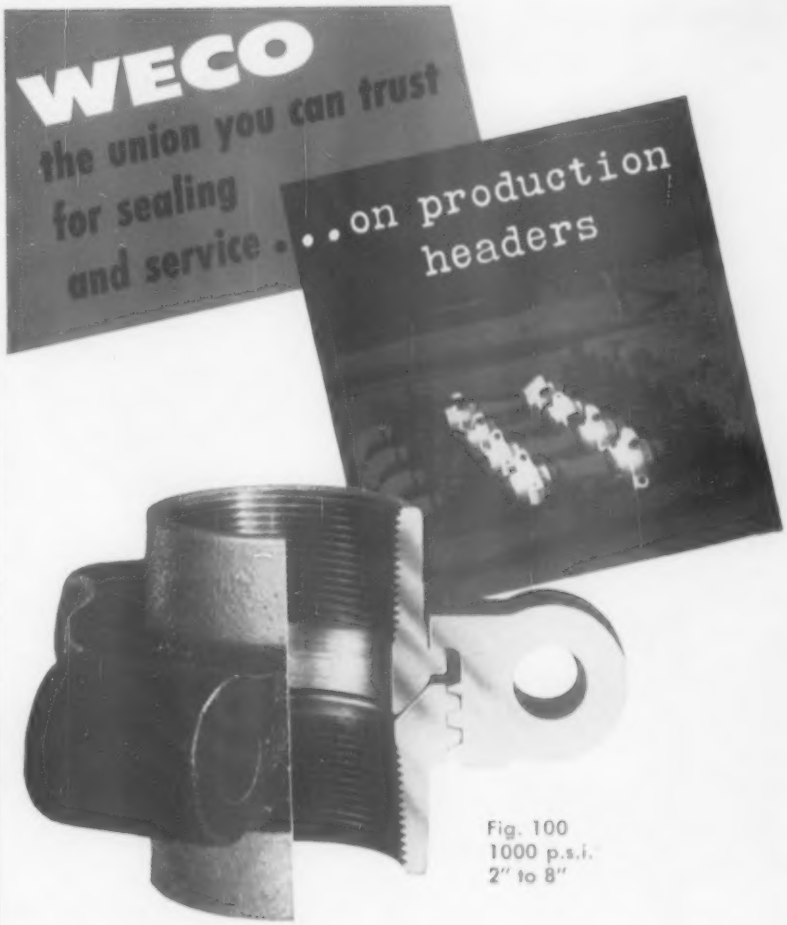

Fig. 100
1000 p.s.i.
2" to 8"

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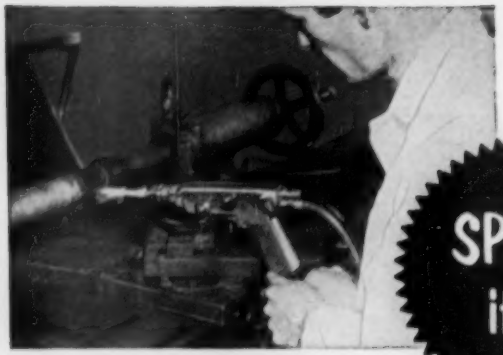

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ing oil importers to exercise 'industrial statesmanship' and voluntarily, without due process of law, to curtail their Middle East imports.

"This is a grossly unfair demand upon the importers. While there may well be times when governments can properly demand of business that it modify its normal activities in the public interest, this is surely not one of them. In this case the importers are being asked to modify their business practices for the benefit of competitors. They are being asked to slight their obligations to the nations from which they draw the oil, to the stockholders who hold their equity, and to the customers who buy their oil.

"Mr. Flemming's course, if he feels he is on solid ground, is formally to invoke the procedures of the Trade Agreements Act for restricting imports. While some security aspects of the case may require secret consideration, one hopes that the core of the case will be debated in public, and that the spokesmen on both sides will be in a position to make an uninhibited presentation of their respective views.

"Once this background has been developed the President should be in a position to decide where the interests of the United States really lie."

Raymond Vernon, former acting director of Office of Economic Defense and Trade Policy of Department of State in letter to New York Times.

Answer to Monopoly

"The proponents of federal regulation say that gas production is a monopoly, or at least that a few large producers control the greater part of the gas reserves . . .

"Figures show that there is a greater concentration in copper, iron ore, lead, zinc, anthracite coal, and in 382 out of 452 manufacturing industries than there is in natural gas production."

Rayburn L. Foster, vice president Phillips Petroleum Co., in address before The Milwaukee Executives Club.

Help for Israel

Dear Sir:

In the vast majority of wells drilled in our country, we are encountering formations with exceedingly severe circulation zones. Every possible means to regain our returns were of no avail to date. Therefore, the only solution we found practical was to drill blind.

Unfortunately, it seems that this method of drilling is prejudicial to the drill pipe. It is believed that they are getting highly magnetized, and therefore are twisting off quite easily. We are considering the use of aerated muds, and we would appreciate it very much if you would send us all the material

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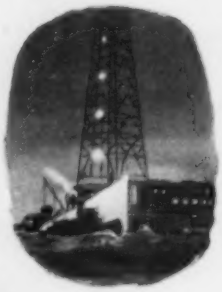
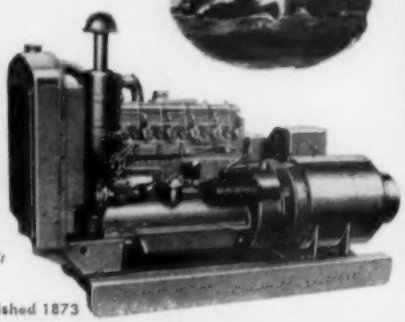


Diesel models for offshore service include sizes 10 to 35 KW for rig lights, floodlights, power tools; 10 KW models are used for quarter boat lights and galley equipment. Gasoline or gas operated liquid cooled models from 2 to 35 KW for all other rigs. Air cooled portable plants from 500 to 5000 watts for seismograph equipment, geophysical survey trucks. Also automatic stand-by plants for refineries. Write for folder E-20.



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that may have been published in your magazine on this subject, and if possible give us your advice as to whom we could apply for technical help in this matter. As this is most urgent, we would appreciate receiving your reply at your earliest convenience.

A. Koifman, petroleum commission State of Israel, Jerusalem.

Editor's Note: Latest engineering articles on drilling with aerated mud were by Messrs. Roy A. Bobo, George S. Ormsby, and R. S. Hoch, drilling engineering division, Phillips Petroleum Co., Houston, in The Oil and Gas Journal, January 26 and February 7, 1955.

Politics and Prosperity

"It seems to me that current prosperity is not the result of hitting the jackpot. It just didn't happen by luck. Current prosperity to a great extent stems from the kind of government we have today.

"And let no businessman make a mistake about it—future prosperity in large part will depend upon the kind of government we have tomorrow."

Sinclair Weeks, secretary of commerce, in address before New Jersey Manufacturers Association, Newark, N. J.

Creeping Regulation

"Unless the Fulbright bill is passed at the next session of Congress, the long, bony hand of federal regulation will continue to touch natural gas production, and will inevitably reach into oil and coal production.

"Both of these competitors of natural gas will be brought into the regimented ring to answer to the calls and whip of the ringmaster far removed from the scene of producing activities."

Ernest O. Thompson, member Texas Railroad Commission, in address before Mid-Continent Trust Conference, Houston.

CALENDAR

NOVEMBER

27-29 New Mexico Oil and Gas Association, Albuquerque, N. Mex.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

DECEMBER

1-3 Interstate Oil Compact Commission, La Fonda Hotel, Santa Fe, N. M.

1-3 American Chemical Society, 11th southwest meeting, Shamrock Hotel, Houston.

2 Natural Gasoline Association of America, Panhandle-Plains meeting, Herring Hotel, Amarillo, Tex.

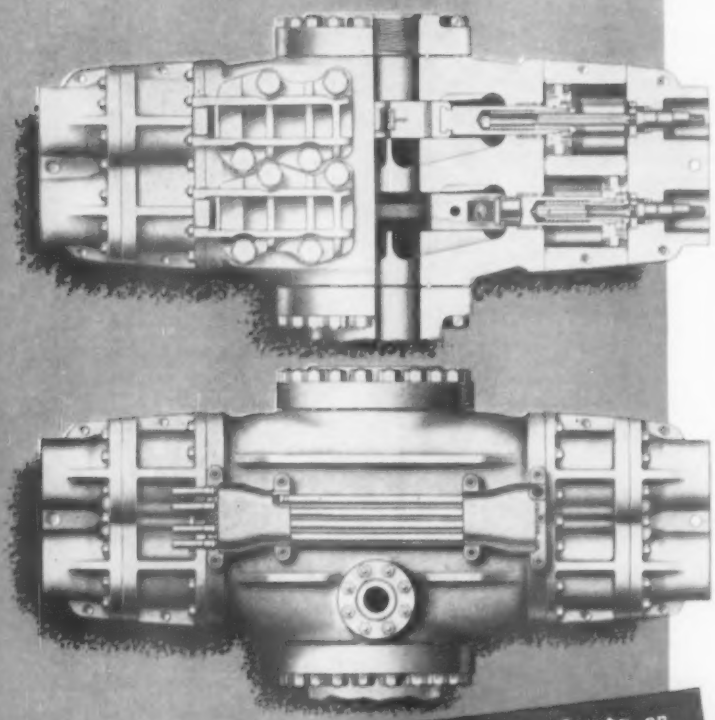
3 National Oil Scouts and Landmen's Association, annual meeting of board of directors, Adolphus Hotel, Dallas.

8-9 Oil Industry Information Committee

Before you Invest— INVESTIGATE!

See why SHAFFER *offers more in Hydraulic Cellar Control Gates!*

Before you put your money on the line for pressure control equipment, we invite you to make a point-by-point comparison of the advantages Shaffer offers — *basic* advantages that assure greater convenience and efficiency on every phase of cellar control gate protection.



(Above) CUTAWAY VIEW
Showing direct hydraulic drive and self-draining ram compartments.

(Below) REAR VIEW
Showing simplicity of hydraulic manifolding for operating the gate.

Get the facts on Shaffer advantages from your nearest Shaffer representative — or write direct for your free copy of the complete Shaffer catalog!

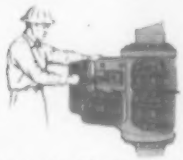
More Compactness!

In all three dimensions—height, width and length—Shaffer Hydraulic Cellar Control Gates are unusually compact.

Furthermore, since the rams are changed through patented side-opening doors, no extra space need be allowed above the gate — or at the ends — for servicing the rams.

Result — even in sizes as large as 13⅝" (12" Series 900) the gate has a *total* required height of only 30". *No extra space above or at the ends is necessary!*

More Convenience!



Rams in Shaffer Hydraulic Cellar Control Gates are easily changed through patented *side-opening* doors. Simply unbolt and swing open the door...change rams...and bolt the door shut again. Closing the door automatically aligns the rams within the gate.

With Shaffer Hydraulic Gates there's no need to dismantle the upper compartment to change rams in the lower compartment — or vice versa. You can change rams in *either* compartment without in any way disturbing or disconnecting the other, because each is completely independent.

More Versatility!

Shaffer — and *only* Shaffer — provides a choice of either *Single* or *Double* Hydraulic Gates, whichever best meets *your* requirements. Rams and most other parts are interchangeable, size for size, between Single and Double Gates, assuring maximum adaptability to *your particular* needs — at minimum inventory and maintenance costs.

More Efficiency!

Only Shaffer provides the added protection of *Self-Draining Compartment Bottoms*, with rams traveling on high guide ribs where no detrimental mud or sand can accumulate. Also, such important Shaffer features as *Direct Hydraulic Drive* (no yokes or complicated secondary connections between rams and hydraulic pistons) ...*Completely Enclosed Design* (no exposed moving parts to jam or corrode) — and still other advantages make Shaffer Gates the most dependable, most efficient available.

Remember—*For those desiring mechanically-operated equipment, Shaffer also manufactures a complete line of* Mechanical *Cellar Control Gates—both Single and Double Types. Ram Blocks and Ram Rubbers for Shaffer Mechanical Gates are interchangeable, size for size, with those used in Shaffer Hydraulic Gates, assuring further savings where both Hydraulic and Mechanical Gates are used.*

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meeting, Biltmore Hotel, New York City.

1956

JANUARY

9-13 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

16-18 Pipe Line Contractors Association, eighth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

FEBRUARY

15-17 National Association of Corrosion Engineers Short Course for Pipeliners, Mayo Hotel, Tulsa.

19-23 American Institute of Mining and Metallurgical Engineers, annual meeting, Hotel Statler, New York City.

24 Natural Gasoline Association of America, Permian Basin meeting, Lincoln Hotel, Odessa, Tex.

26-29 American Institute of Chemical Engineers, Statler Hotel, Los Angeles.

27-29 American Association of Petroleum Geologists, Rocky Mountain Section, Auditorium, Denver.

MARCH

7-9 American Petroleum Institute, Division of Production, Southern District meeting, Plaza Hotel, San Antonio, Tex.

12-16 National Association of Corrosion Engineers, annual convention, Statler Hotel, New York City.

19-21 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

21-23 American Petroleum Institute, Division of Production, Southwestern District meeting, Texas Hotel, Fort Worth.

APRIL

3-5 Annaul Corrosion Control Short Course, University of Oklahoma Extension Study Center, Norman, Okla.

4-6 American Petroleum Institute, Division of Production, Mid-Continent District meeting, Broadview Hotel, Wichita, Kans.

11-13 Natural Gasoline Association of America, Texas Hotel, Fort Worth.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel & Club, Boca Raton, Fla.

15-17 Texas Independent Producers and Royalty Owners Association, Statler Hilton Hotel, Dallas.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

18-20 American Petroleum Institute, Division of Prduction, Rocky Mountain District meeting, Cosmopolitan Hotel, Denver.

18-20 National Petroleum Association, semiannual meeting, Cleveland Hotel, Cleveland, Ohio.

19-21 Gas Appliances Manufacturers Association, annual meeting, The Greenbriar Hotel, White Sulphur Springs, W. Va.

23-25 Southern Gas Association convention, Dallas.

23-26 American Association of Petroleum Geologists and Society of Economic Paleontologists, annual meeting, Conrad Hotel, Chicago.

25-27 American Petroleum Institute, Division of Production, Eastern District meeting, Deshler-Hilton Hotel, Columbus, Ohio.

30 May 1 Independent Petroleum Association of America, semiannual meeting, Statler Hotel, Los Angeles.

30 May 4 American Petroleum Institute, Safety and Fire Prevention midyear meeting, Warwick Hotel, Philadelphia.

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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

A.P.I. and S.F.

SAN FRANCISCO is a wonderful place to live, to visit, and to hold a convention—provided the convention isn't quite as big as the annual A.P.I. meeting. It put a bit of strain on that city's justly vaunted hospitality to take care of some 5,500 oil men.

The city has lots and lots of hotels—hotels nobody ever heard of before. But oil men know about them now, because they or their friends were quartered in them. The workings of the housing committee were a great mystery because practically nobody got the location he asked for, and the way delegations were split up and spread around was a matter of wonderment.

But we finally figured out a method to the seeming madness. The way we get it, it was all a promotion stunt. By quartering the A.P.I.-ers all over town, the committee succeeded in getting publicity for some little-known hostelries and caused the visitors to walk past many of the city's multitudinous bars, restaurants, and souvenir stores which otherwise might have been missed. It also gave the delegates some much-needed fresh air and exercise traipsing from one hotel to another.

San Francisco hotels go more for class than capacity, so it took four of them—in different parts of town—to make up the official A.P.I. headquarters, plus a couple of dozen more for sleeping (though our observation was that most of the visitors didn't do much sleeping).

This disintegration of the industry made it difficult to locate people you wanted to talk to. They were always at some other hotel. For example, the Top Brass were sequestered in exclusive habitats on Nob Hill—often called Snob Hill—far away from the working stiffs and run-of-mine oil men. That was another triumph of the housing committee.

But the housing committee wasn't quite perfect. It slipped up in one or two instances. For example, Jake Hamon, new A.P.I. board chairman, had his reservations go awry, and found that the hotel clerk had never heard of him. He had to rout somebody out of bed to get a room. Did he rout out the chairman of the housing committee? Heck, no. (The chairman was probably in hiding anyway). Jake went right to the top and woke up Frank Porter, A.P.I. president. It's a chairman's prerogative to call on the president to do anything that needs to be done, and we were glad to see that Jake is starting off his new duties with the proper executive approach.

Via Cable

OIL men visiting San Francisco were intrigued by that anachronistic survival of transportation before the petroleum and automotive age—the cable car.

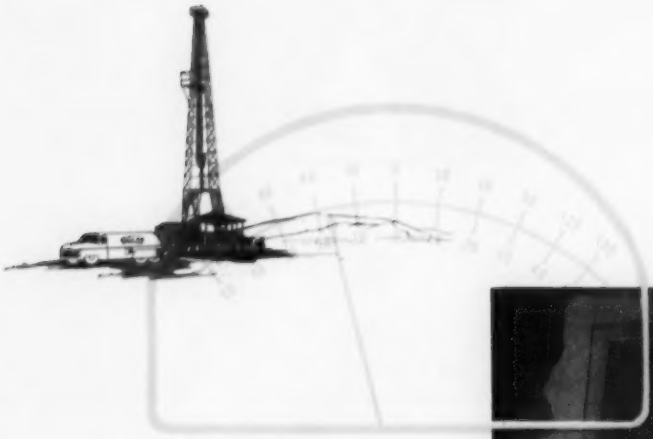
At any hour of the day or night you could see A.P.I.-ers hanging three deep on the outsides of those cable cars (we never knew of anybody to really get inside of one). San Franciscans apparently don't mind living dangerously, but this business of hanging precariously on the side of a tiny car while being hauled up the face of a cliff proved perilous to visitors from flatter regions.

So it was for Dave Stormont, the Journal's Los Angeles editor. He was in the third layer of hangers-on when a snooty Cadillac swung around a corner and wedged into the hapless mass of humanity. Dave's leg was pinned between cable car and Cadillac, and there he stayed until a police car, a wrecker, and an ambulance extricated him.

Examination showed no damage—his pants weren't even torn—and the freed prisoner ate a hearty dinner. But the real damage came the next morning when a local newspaper reported the accident and identified our own Stormont—who has never worked for anybody except our favorite publication for 20 years—as a press agent for Standard Oil.

That was a crushing blow. For years we all have tried our best to refute the canard that the Big Yellow Book is an organ of the majors, and then this happens. It just ain't so. We wear no major's collar, San Francisco newspapers to the contrary notwithstanding.

—*Henry D. Ralph.*



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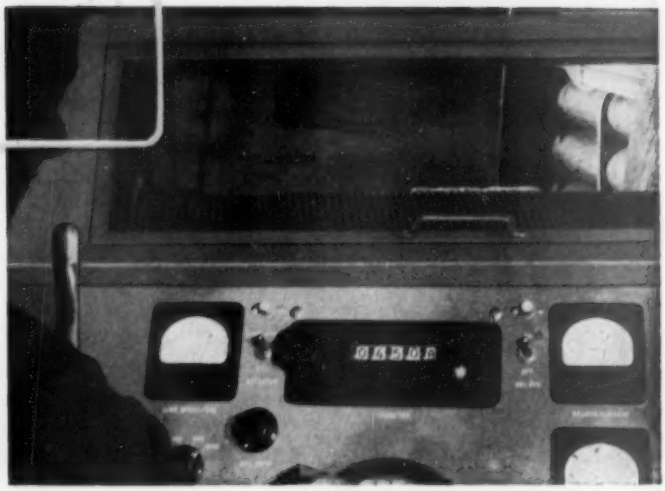

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Now standard equipment on all Welex perforating and logging trucks, the new super-sensitive Magnetic Collar Locator works under the toughest well conditions. This new Collar Locator will find *flush joint collars — in extremely heavy mud and in the deepest wells!* You pay nothing extra for this great accuracy — just...

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Welex JET SERVICES INC.

Prepare now to increase capacity for the future

THE oil and gas industry must make tremendous investments of capital funds to expand its capacity during the next few years. That is one prediction on which everybody agrees.

This year's capital spending by the industry is variously estimated at from a little under 5 billions to upwards of 5.7 billions of dollars. This is expected to be increased by at least 5 per cent next year, and could go much higher than that.

Jersey Standard set the pace by announcing a 1956 capital budget of $1.2 billion—nearly 20 per cent ahead of 1955. Other companies have not completed their budgeting, but most of them are known to be setting their sights high. Banker Lyon Terry told the A.P.I. in San Francisco that the industry's capital expenditures may reach $9 billion a year by 1965.

THERE IS NO INCONSISTENCY between present planning for new facilities and the fact that the industry currently is struggling to carry some unused capacity in most of its divisions, particularly production. Forecasts of increasing demand during the next year and the next decade make it plain that the present margin of surplus could vanish rather quickly.

Oil men know, though the public may not, that there is a vast difference between current producibility of oil and gas and the ratio of proved reserves to annual consumption. New additions to reserves are needed, and it normally takes 2 to 5 years between budgeting for exploration and getting a new field into maximum production. Somewhere between two-thirds and three-fourths of the industry's new investment will go into exploration and production.

The nation's total of modern refining capacity is not greatly in excess of current needs, and the factors of competition and obsolescence require continual new investment even if no growth in demand were expected. Much the same is true in other divisions of the industry.

WHERE WILL ALL THE MONEY COME FROM? There is just one place: from the industry's earnings—past, current, or anticipated. Some of the funds will be transferred from withheld earnings and depreciation accounts. The rest will be obtained from institutions or the investing public. But every lender or investor will look at the company's prospective earnings, at the probable payout of the new facilities.

Either to generate or to borrow the needed capital, the industry must keep its earnings in shape to justify the required investments. It must see that the prices of what it produces and sells will pay out the new facilities called for by expanding demand.

If earnings, in every branch of the industry, don't keep pace with capital costs, money won't be forthcoming for expansion and the industry will liquidate itself out of business.

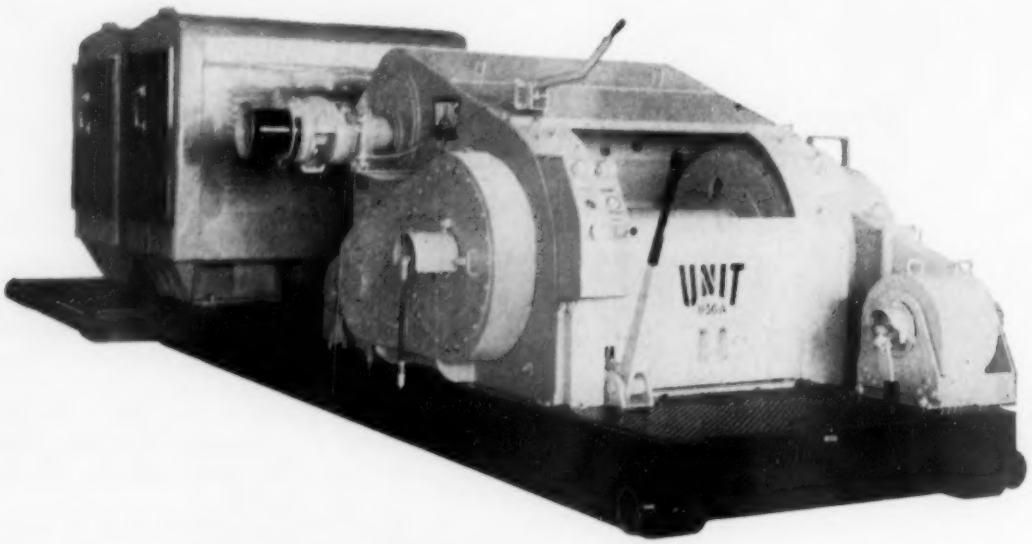


Photo of U-36-A Draw Works, from Driller's side.

Unit Rig Introduces a New Shallow-to-Medium Depth Draw Works

The U-36-A designed for drilling depths requiring a range of 300 to 500 HP

The new U-36-A meets the requirements of drilling contractors who need flexibility and simplicity of operation in a shallow to medium depth draw works. This newest Unit Rig draw works is rated conservatively for maximum input horsepower of 500. However, this flexible unit can be used economically with less power for drilling in areas where the maximum input horsepower is not required. In fact, the unit may be used efficiently for drilling any depth requiring a horsepower range of 300 to 500.

The U-36-A is designed to be transported as a single package in the field or it can be separated into two packages for highway moves. With a single or two-engine unit, the compound and engines are mounted on a common skid and are moved as an integral unit. This construction insures engine alignment at all times.

Simplified design . . . Unit Rig engineers have incorporated several unique features in the design of the U-36-A. It was their desire to produce a rig that would fill a need for maximum performance with the minimum of parts. For instance, the use of an air clutch for the catshaft drive eliminates the necessity for an inertia brake. On the double-drum model this catshaft air clutch also allows the use of a positive clutch on the sand reel and eliminates the introduction of air through the cathead. The simplified control panel consists of only four air valves.

Fawick Ventorque 24" VC 650 clutches are used for high and low drum clutches. This application gives a high degree of interchangeability. The air space between friction surface and operating tube on the VC type clutch insures maximum cooling at all times. The torque is transmitted through steel pins, thus relieving the tube from torsional loading.

Extra large drum . . . The U-36-A has an extra large drum (18" diameter x 46" long barrel) which provides less than three wrap spooling when hoisting 90 foot stands with a six line reaving system, and has Lebus grooving for 1⅛" wire line.

Incorporated with the large drum are self-energized, equalized, single point adjusted mechanical brakes. The brake rims are 44" diameter by 10" wide.

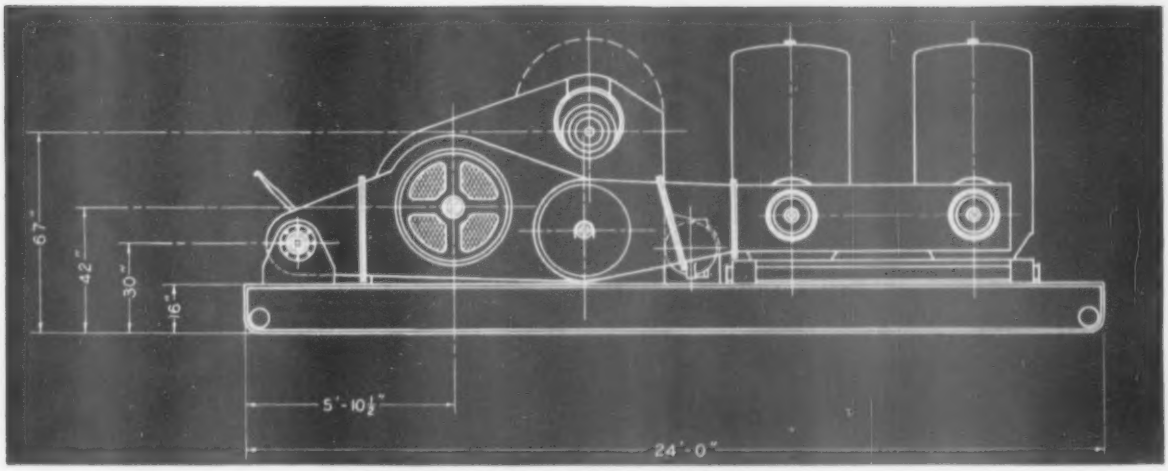
The highly portable, compact U-36-A is available in both single and double-drum models, and either model can be trailer mounted.

Special features . . . The U-36-A has Unit Rig fully enclosed water circulating brake rims of forged alloy steel, for maximum service life. The 15" double hydromatic brake is of the high speed, built-in type with automatic clutch.

The low or high clutch control valve also operates throttles. Therefore the engine is always at idling speed when clutches are engaged. Both low and high clutches can be serviced without shaft removal.

Other important features of the U-36-A are: emergency locking pins for low drum and catshaft drive clutches, large diameter, alloy steel shafts with short center distance between main load bearings; independent torque converters for each engine; oil-tight cases; and

—Advertisement



U-36-A Dimensional Layout — Side Elevation.

pressure lubricating system.

The main skid is 24' long, by 6'8" wide. The skid beams are 16" x 8½" for minimum deflection with minimum weight. The width of the draw works is 9" 3¼", and stands 7' 2½" high, less sand reel.

The U-36-A has been in the making for over a year. The first unit was not put in the field until Unit Rig engineers had been satisfied that their main objectives — rugged dependability and simplified operation — had been accomplished. Incorporated in the unit are the simplicity of the popular U-34 and the ruggedness and dependability of the new U-1220.

Complete information on the new U-36-A may be obtained from the following supply stores: American Pipe & Supply Co., Bovaird Supply Company, Houston Oil Field Material Company, Industrial Supply Company, Iverson Supply Company, Lucey Products Corporation, Mid-Continent Supply Company, Norvell-Wilder Supply Company, The Republic Supply Company of California; or direct from Unit Rig & Equipment Co., Tulsa, Oklahoma. Export sales are handled by Mid-Continent Supply Company, 45 Rockefeller Plaza, New York 20, N. Y.

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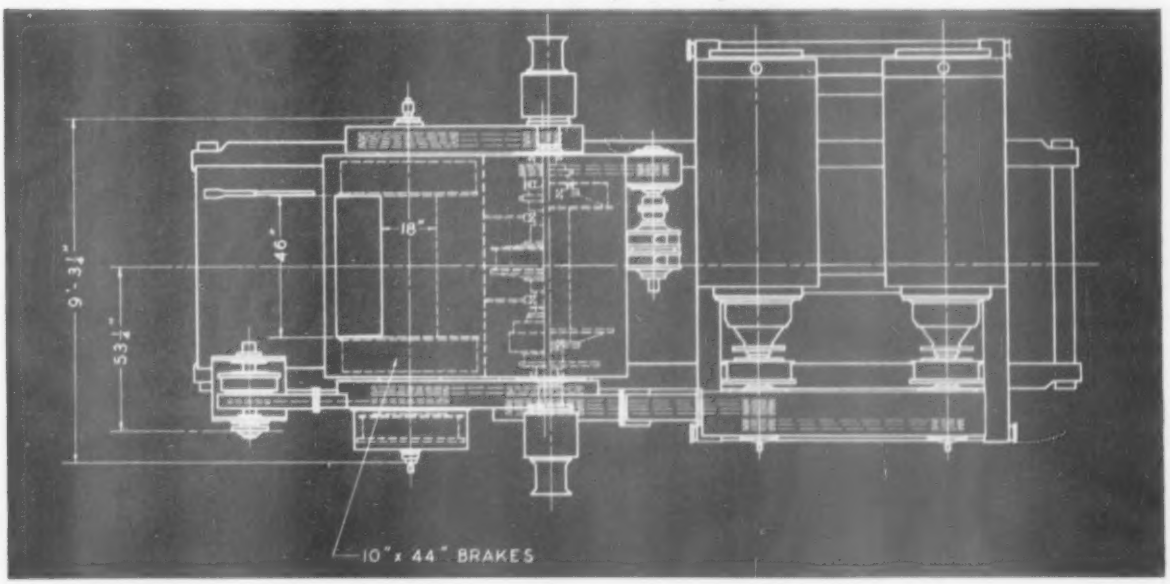
Chain Drives

	Size
Engine Compound	1¼" Triple
High Drum Drive	1½" Double
Low Drum Drive	1½" Triple
Input	1¼" Quad
Catshaft — Sand Line	2" Single
Hydrotarder	1¼" Triple
Rotary Countershaft	1½" Single

Speed Ratio Factor between High and Low — 2.7:1

U-36-A Dimensional Layout — Top View.



GLASS GUN

DOWELL Electric Pilot tool perforates with 20,000 m.p.h. gas jets

Jets from the Glass Gun perforate the casing and the pay at 27 times the speed of sound. They have proven ability to penetrate more than seven inches of steel . . . to pierce eleven and one-half inches into a sand formation through two casing strings and two inches of cement.

The Glass Gun, a product of Dowell's continuous research program, has been proved in the field. Glass-encased shaped charges hold more explosive—pack more punch per shot. The aluminum-tube carrier contains explosive Primacord to destroy the entire gun—leaving only minute particles in the hole. Various shot patterns, gun lengths and diameters are available to fit well conditions. Electric Pilot instruments and controls assure accurate positioning in the hole. And Dowell employs the latest safety devices and strict safety precautions for your protection.

Other Dowell Electric Pilot services available on the same job include: spinner, permeability, channel determination, water location, caliper and temperature surveys, plus selective acidizing, radioactive selective acidizing and gamma ray logging service.

For Glass Gun perforating and other Electric Pilot services, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department K-11.

services for the oil industry

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Current and significant in . . .

The Industry This Week

Production

• **Engineers have taken a fresh look at Long Beach subsidence.** And they've decided an ocean water flood is the only practical way to halt the sinking, caused by withdrawals from Wilmington field. Engineers figure a million-barrel-daily flood—far bigger than any yet attempted—would be required to restore reservoir pressures and stop surface subsidence within 3 years. P. 48.

All orders controlling Rangely field production have been cancelled. The action was taken by the Colorado Oil and Gas Commission because its power is "uncertain and doubtful" since a court upset of its gas-injection order. The commission says it prefers to work for a new law rather than face a drawn-out court battle. P. 55.

Pipelines

• **The world's first major underwater pipelines** are being planned by a Houston firm, Offshore Gathering Corp. It wants to build a 30-in. gas line and 20-in. crude line for 364 miles along the Louisiana coast to serve offshore fields in the gulf. P. 60.

A new complicated gadget, called the "Mole," has been successfully tested to locate and survey submerged pipelines at river crossings. P. 50.

Processing

• **Startling progress in applying isotopes to refining projects** is reported by Esso Research & Engineering.

Studies have shown, Esso says, that radiation can increase gasoline yields, speed up catalytic reactions, make new lube additives, and promote chemical reactions without use of catalysts. P. 65.

First open hints have been dropped that designers must develop milder engines in future automobiles. Present severe engines can't make best use of high-octane fuels that can be produced by practical refinery processes. P. 54.

An unusual double-product payout is expected from Texas Butadiene & Chemical's new $26 million Houston plant. Butadiene is the primary and long-range product. But since the process also gives off components of alkylates, avgas will be made in the early stages of operation for a second income producer. P. 56.

Drilling

• **Record well is past 22,000 ft.** and still drilling ahead. The 22,000-ft. mark was reached at 7 a. m. November 23. Richardson & Bass, operator of the deep Louisiana project, had no immediate plans for bottoming or attempting completion. P. 57.

New cement additives make possible better, and cheaper, cementing jobs. Field tests, the manufacturer says, have shown that three new additives can reduce density, cut water loss, and slow down thickening—while making a better and cheaper job of cementing. P. 59.

Oil-country tubular goods are in shorter supply than any time since the '52 steel strike.

The shortage is due to become more acute if drilling is increased next year. It's a question whether companies will be able to drill all their planned wells in the next 12 months. P. 62.

WELLS WERE ELEVATED 20 ft. at Long Beach Pier E to offset surface subsidence. The power plant in the background, located in the heart of the bowl-shaped sinking area, has dropped about 22 ft. It is now below sea level.

To halt Long Beach subsidence . . .

. . . Million-Barrel Flood Suggested

D. H. Stormont

LONG BEACH.—A gigantic water flood using ocean water may be launched to save Long Beach from further sinking.

It would take the world's biggest flood—injection of a million barrels per day—to halt the destructive subsidence. Even that remedy would be 3 years in restoring reservoir pressures in Wilmington field and stabilizing the land surface.

For the land has already dropped several feet, and it's still sinking in the harbor area because of oil and gas withdrawals from Wilmington. The city has invested millions just to repair the damage. Dikes have been built to ward off an invasion of the Pacific Ocean. Producing facilities have been raised with earth fills.

But further damage can be expected, more even than was first believed.

Other areas of Long Beach, away from the center of oil production, are threatened unless corrective measures are taken. Engineers predict an ultimate subsidence of 4 ft. in the downtown area. It will sink that much if producing activities in Wilmington aren't expanded beyond presently developed limits. And if the undeveloped southeastern part of the field is drilled, drained zones will be crushed by overlying rock and a drop of some 8 or 10 ft. is expected.

Up to now the city has been engaged in a running battle to keep the Pacific from flooding harbor installations at high tide. Now engineers propose to use that sea water to prop up depleted reservoir rocks and hold the beach above tide level.

The water-flood solution was offered by Dr. Frank G. Miller, professor of petroleum engineering at Stanford University.

He reported to two state assembly study committees on research conducted jointly with W. H. Somerton of the University of California, Berkeley. They were aided by Dr. S. T. Yuster of U.C.L.A. and Dr. C. M. Beeson of U.S.C. in the study carried out at the request of Richfield Oil Corp., which operates city oil properties for Long Beach.

The cause . . . They found that subsidence is definitely related to production of oil from the Tar, Ranger, and Terminal zones of Wilmington field. Empirical mathematical relationships between the depth of the depressed land area and the production of fluids from the field checked remarkably well for the past 9 years.

Production of one billion barrels of fluids from these zones has resulted in a bowl-shaped cavity which covers about 20 sq. miles and is now 22 ft. deep at its center. The engineers said the epicenter can be expected to drop an additional 13 ft.

That is considerably more than was indicated by earlier studies, which concluded the center of the bowl would sink only some 27 ft.

The latest study listed these possible causes of sinking:

. . . Earth movements.

. . . Surface loading and vibrations.

. . . Reactions in shallow-water sands.

. . . Fluid withdrawal from oil reservoirs and associated strata.

The first three possibilities were considered but for one reason or another they were believed to be of little or no importance.

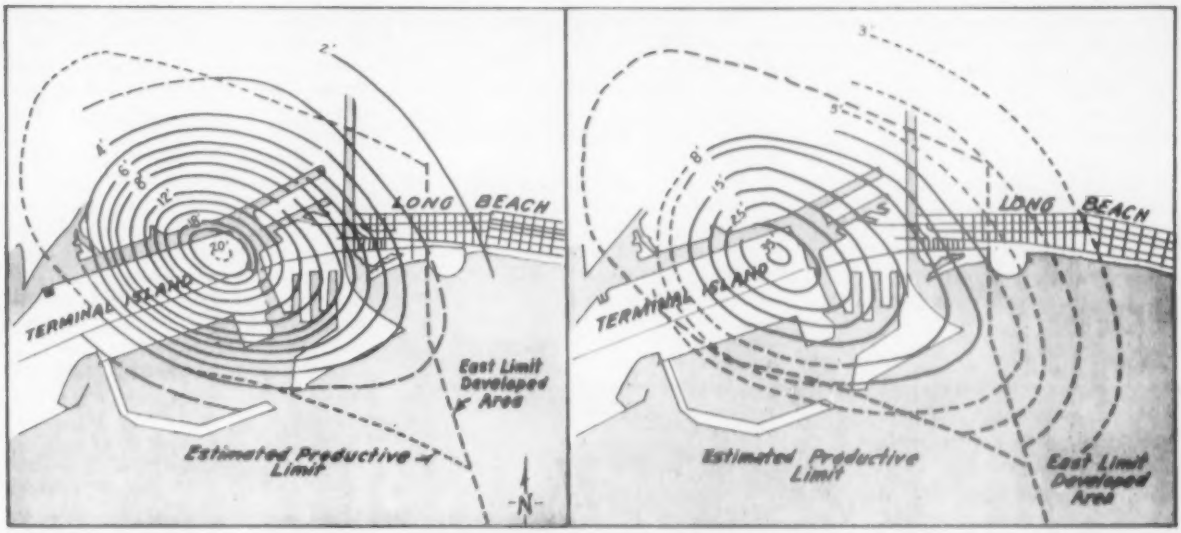
On the other hand, they found that center of maximum subsidence tends to remain vertically above the geometric center of fluid withdrawals. The center of fluid withdrawal could not be determined accurately. But the approximate center has shifted to the southeast as production was extended in that direction.

Using material-balance principles, authors of the study report arrived at a cause-and-effect relationship between the depth of the depressed land area and the production of fluids. These revealed that "since 1947 the depth of subsidence has been a logarithmic function of the cumulative withdrawal of oil, the net vacated space in the oil reservoir rock, and the reservoir replacement volume (net vacated space plus volume of water influx)."

This relationship was found to hold true not only for the epicenter but also for 32 benchmarks in the sinking area.

What to do about it . . . To halt the serious land drop, three steps were mentioned:

. . . Stop oil production. California would lose the field which led the state in oil production last year.



EXTENT OF SINKING in Wilmington field, as of August 1, 1954, is shown by contours above. Center of the bowl-shaped cavity is 20 ft. below the surface level before sinking began. Contours in the other drawing represent the ultimate size and shape of the bowl, the center to be 35 ft. deep.

THESE SUBSIDENCE CONTOURS are plotted on the basis of all further oil production from the presently developed area of the field. The cavity will elongate to the southeast, taking in other areas of Long Beach, if undrilled portions of the field are developed and corrective measures aren't taken.

. . . **Inject gas to restore pressure** in the underground reservoirs.

. . . **Inject salt water** into the partially depleted reservoirs.

Salt-water injection was recommended by Dr. Miller because sea water is readily available and sufficient volumes of gas are not. Its feasibility is being checked in a pilot flood which has been operating for some time.

"A full-scale, coordinated water-injection program should result in a substantial increase in the ultimate recovery of oil, in addition to retarding and eventually stopping subsidence," he declared.

"Since the process of compaction resulting from reservoir pressure decline is essentially irreversible, the restoration of pressure in depressured portions of the field would not raise the land surface any significant degree. Restoration of pressure, however, would arrest further settlement of the land and would cause the oil to have characteristics that are more desirable. Thus, the problem involves an important element of timeliness."

The epicenter of the sunken bowl is near the Southern California Edison Co. power plant on Terminal Island. And the current rate of subsidence there was shown to be about 1.5 ft. annually.

If injection of 1,000,000 bbl. of sea water daily were started immediately, it would require 3 years to fill voids created by gas and fluids already withdrawn from the Tar, Ranger, and Terminal zones. And by then, the area would have sunk an additional 3 or 4 ft.

The zones are described as being predominantly of the solution-gas-drive type, possibly accompanied by encroachment of edge water. "The natural flood, however, would advance under conditions of low pressure," Dr. Miller said.

"In a water-injection program the pressures would be maintained at a considerably higher level. Maintenance of reservoir pressure or restoration of reservoir pressure to a high level causes the reservoir oil to retain desirable characteristics. For example, the absolute viscosity of a Ranger-zone crude will increase about 300 per cent if the pressure declines from 1,600 to 200 psia.

"Action taken in the past to cope with subsidence has been to remedy the effects rather than eliminate the cause. Although foundations have been raised, earthen dikes constructed, land filled in, and relatively small-scale gas injection and water flood operations have been implemented, no major action of the magnitude necessary has been taken to prevent the subsidence directly. These facts and the impracticability of abandoning the field, or of injecting large volumes of gas, plus the cause-and-effect implication of the fluid withdrawal-subsidence correlation, lead to water flooding as the apparent solution of the problem."

PILOT WATER FLOOD using ocean water is determining the effect of the technique on oil recovery and reservoir pressures in Wilmington field. Surface facilities of two injection wells are shown at Pier B, Long Beach. The wells are bottomed about 2,000 ft. away, one on either flank of the three-well subpool being flooded.

Geologic explanations . . . Why is the Wilmington area subsiding while nearby fields, such as Signal Hill, are not?

W. J. Travers, vice president of Richfield, told legislators at the hearing that the answer lies in the nature of their geologic structures.

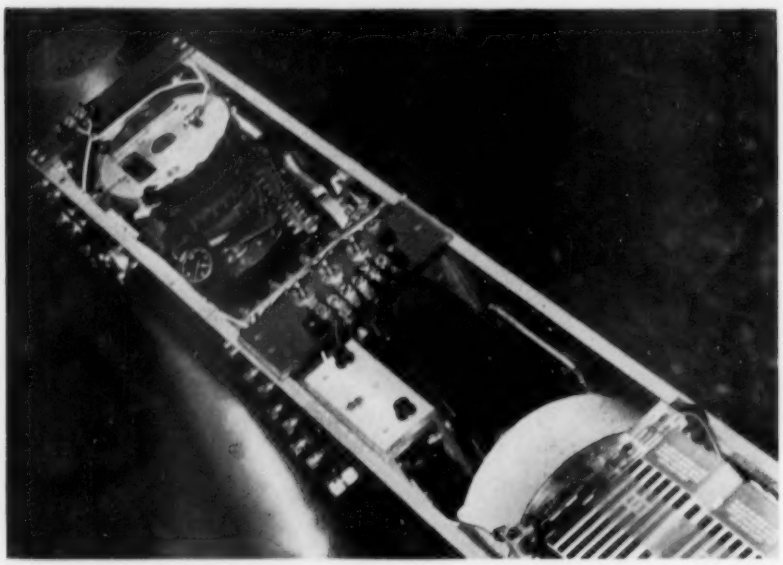
"Signal Hill is a strongly folded anticline with steep flanks," he explained. "The rock overlying the oil zone con-

tains a sizable percentage of shales which have considerable structural strength. The anticline forms a strong arch which resists subsidence, even though some of the support is removed below the crest.

"Wilmington, on the other hand, is weakly folded. The flank dips are very gentle, approximating 10°. The overburden above oil sands consists largely of unconsolidated sand. This fact, combined with the low angle of folding, produces an arch which has little structural strength.

"The combination of these structural characteristics, plus a large thickness of productive sands, all occurring in an area where elevations with respect to sea level are critical, is without parallel in California, or anywhere within my experience."

The explanations and proposals to check the damaging land drop were presented before a joint session of the State Assembly Committee on Manufacturing, Oil, and Mining Industry and the subcommittee on Long Beach tidelands.



Latest in complicated gadgets . . .

. . . "Mole" Locates Pipe

HOUSTON.—Hunting for your submerged pipeline? Want to know if it's in the ditch safely covered with mud, or maybe partially exposed by the current?

Try the "mole," says W. F. Krueger, Sperry-Sun Well Surveying Co.

The "mole" is a three-dimensional pipeline surveying instrument. When run through a submerged pipe, it will give an accurate plot of where the pipe lies. This can be compared with a profile and map of the crossing to determine just what the underwater situation is.

Krueger told the Houston Pipe Liners Club the "mole" already has had a shakedown run on 10 river crossings. Three were across the Atchafalaya averaging 1,500 ft. The others were under the Mississippi, varying in distance from 3,500 to 9,000 ft. Pipeline diameter varied from 16-in. to 30-in. line. The "mole" can fit in any size line down to 10-in.

How it works . . . Technically, the "mole" is a gyroscopic, multishot pipeline surveying instrument.

It's enclosed in an air-tight protective casing. Four wheels are fixed at each end of the casing, only two of which roll on the pipe. The instrument parts are mounted on a cradle which swings from pivots in the end plants. The cradle is free to swing and act like a plumb bob. This means the outer casing can corkscrew without the cradle's turning upside down.

Chief instrument parts are the gyro, inclinometer, watch, camera, and timer. In addition there is a light system and direct current source furnished by dry-cell batteries.

The timer governs the camera. It in turn takes a film record every 15 seconds on 16-mm. movie film. The camera protographs the gyro and inclinometer readings and the time. These are the three elements needed to perform a three-dimensional survey of a pipeline.

The gyro gives pipeline direction. The inclinometer indicates the pipeline slope. The watch tells the time and, hence, at what point the record was taken in the pipe at each reading. The operator on the bank keeps a time-distance record of the survey. He uses a wire line meter and a watch synchronized with the instrument.

The "mole" is pulled through the pipe on a wire line. But that is the only control. It's stopped at every survey point for 25 seconds to obtain still pictures. It's completely self-contained and self-operated once started through. The survey interval normally is 40 ft. Records often are made every 10 ft. through sharp changes.

Methods vary for getting the wire line across to the other side of the crossing. On a new pipelining crossing, the wire line can be tied to a pig and blown across with compressed air. On a line in service, it can also be tied to a pig, and line pressure used to push them over. In a crude or products line, it can be tied to a scraper or products plug.

A restraining line is attached to the rear end of the "mole" to pull it back on the reverse run.

Why survey? . . . Contractors on river crossings want to be sure the line is laid in its trench and suitably covered with fill. A survey at this point will confirm this condition.

There are other surveying methods but they have limitations. Operators can take lead line soundings and use a fathometer to get reasonably accurate profiles of both the line and river at the crossing.

In fact, Krueger reported a pipeline firm on one crossing took numerous sounds along the line as a check on the "mole." Profiles obtained by both methods checked within a foot.

The sounding method has decided limitations, especially when lateral movement is involved.

This is the case when the tendency of the line is to drift from its original position. The scouring action of the current as it cuts a new channel can cause the line gradually to work its way downstream. Joints may be added as needed on the bank to avoid breaking the line. But the submerged portion can shift hundreds of feet from its original position and be alternately buried and exposed.

This situation is undesirable and it's here the "mole" can give a quick report on the line's position.

Gas Proration Ordered

Louisiana to set allowables at December 9 hearing; it's most sweeping move ever taken to control gas production

Joe Reilly

BATON ROUGE. — Production of natural gas in Louisiana will be prorated, starting January 1, under an order issued last week by the state's Department of Conservation.

First quarterly production allowables will be set following a December 9 meeting in New Orleans at which the commission will consider gas purchase nominations.

Ratable taking of gas, never enforced in Louisiana on a state-wide basis, is provided by the Conservation Act of 1940 which governs oil-production allowables. John B. Hussey, state conservation commissioner, said the new order will place gas production under regulations similar to those controlling oil output.

Hussey said the order applies to all Louisiana wells producing gas from "nonassociated" gas pools. Exempted from the new controls are oil wells producing casinghead gas and pools governed by special orders for cycling or pressure-maintenance operations.

"Purpose of the order," the department explained, "is to require that gas be taken ratably from wells completed in and producing from a common pool." The order is intended to assure a fair share of production from each reservoir for every landowner or producer involved.

How it's figured . . . Allowables will be based on demand for gas from a given pool, ability of an individual well to produce, and amount of productive acreage assigned to a well.

Total indicated requirements from a pool will be allocated among the wells within the pool according to a formula or special order adopted for that pool. Or, if no such formula has been approved, allocation will be according to the productive acreage.

So that data may be available on which to base the first quarterly allowable, producers must submit results of recent production tests for each well affected by the new order on or before December 5. These data must be submitted to district managers of the Conservation Department.

By the same date pipeline companies shall file affidavits stating the volume of gas to be purchased or withdrawn from each pool during the first quarter of 1956. One copy shall go to the commission headquarters and one copy to the appropriate district office. Future quarterly nominations are to be made on or before the fifth day of March, June, September, and December.

Producers must conduct semiannual deliverability tests of producing wells. They must keep monthly records of cumulative production to show whether their wells are producing more or less than their allowables.

Cumulative overproduction in the last 6 months of the year must be eliminated during the following 6 months, and underproduction for the last 6 months may be made up during the next 6-month period. In event of overproduction as of July 1 of any year, a well must be shut in until its surplus output is eliminated. Any underproduction on July 1 is automatically cancelled.

Sweeping change . . . Last week's directive is Louisiana's first formal statewide order controlling gas production.

It is one of the most comprehensive orders ever issued by any state to control gas production. Until now, Louisiana's production has been controlled chiefly by pipeline demand or by orders governing individual fields.

Possible methods to be used in prorating gas production have been studied by conservation officials, pipeline companies, and producers for several months. Experimental orders have been issued in the past for particular fields.

Two Small Crude Lines Sold

DENVER. — Two crude lines serving eastern Colorado oil fields are being sold to the Arapahoe Pipeline Co., Independence, Kans.

Requests for approval of sale of the gathering systems were filed with the Colorado Public Utilities Commission last week by Goodall Pipeline Co., also of Independence, and Pawnee Pipeline Co., Chicago. No purchase prices were included in the applications.

The Goodall system operates in the Little Beaver Creek, Middlemist and West, East and South Badger Creek fields in Washington and Adams counties. Pawnee serves the Adena field in Morgan and Adams counties.

Movie-Lot Wells Producing

LOS ANGELES.—Universal Consolidated Oil Co.'s seven wells on the 20th Century movie lot in Beverly Hills were put on production last week. The wells are flowing 3,000 bbl. daily of clean 27°-gravity crude. An eighth well was drilling ahead at 8,039 ft.

Almost 2 years elapsed between the time the first well was spudded in and the lease was put into production. The seven wells are producing from three known different zones. In addition to the three proven sands at 5,300 ft., 7,000 ft., and 7,903 ft., the operators report hitting one other possible zone at 6,800 ft. Another zone at 4,800 ft. has been shut in. The wells, which are slant-drilled, are producing from Miocene formations.

Production from the wells is flowing into two 3,000-bbl. and two 1,500-bbl. tanks on the lease. Union Oil Co. recently completed its pipeline to the tanks.

Winter Halts Work

Phillips only operator braving Alaskan cold

FAIRBANKS. — Approach of winter weather has slowed down oil drilling operations in Alaska. Only one operator, Phillips Petroleum Co., plans to drill through the winter.

Phillips reportedly is preparing to drill two more test wells in the Katalla and Yakataga districts along the the coast of southeastern Alaska. Equipment is being moved in, and plans call for braving the winter ice and snows to continue work.

Phillips has spent more than $1,500,000 in putting down a stratigraphic test and drilling its Sullivan Unit No. 1 to 10,013 ft. Good oil shows encountered were not considered commercial. The firm holds a 1,065,884-acre concession and is obligated to drill 12 test wells in the next 10 years (*The Oil and Gas Journal, August 29, page 52*).

Havenstrite Oil Co. has suspended operations on Iniskin Peninsula at 9,745 ft. with no commercial oil shows yet indicated.

Climax Molybdenum Co. during the summer transported drilling equipment by barge and helicopter to a uranium find on Prince of Wales Island west of Kechikan. Tests reportedly proved extremely satisfactory before work was suspended due to winter weather. Climax workers expect to return in the spring.

Officials for Standard Oil Co. of California, Shell Oil Co., and Richfield Oil Corp. indicated they will do more geophysical work next summer before ordering any drilling begun. Exploratory crews of the three firms this summer conducted surveys on the Alaska and Kenai peninsulas along Cook Inlet.

Imports to Keep Rising

First-quarter imports to surpass record 1955 period if companies' reports to Railroad Commission are borne out

REPORTS to the Texas Railroad Commission indicate that both crude and product imports for the first quarter of 1956 will show increases over the first quarter of this year.

Actual reports of crude imports to the commission for the first quarter of 1955 averaged 727,900 bbl. daily. The average for the first quarter of next year is 811,900 bbl. daily for a gain of 11.5 per cent. The average for the first quarter of 1956 includes estimates for two small importers who said they were unable to forecast their imports for the quarter.

Another influencing factor indicates that the gain will be even larger than that indicated by the reports to the commission. For the first quarter of 1955, reports to the commission accounted for all but about 8,000 bbl. daily of crude imports reported to the Census Bureau of the Department of Commerce. Most of this was brought in by small refiners in the Great Lakes area.

By the middle of the past summer, Canadian crude started coming in for the Great Northern refinery in Minnesota. Since this crude is not included in the commission's report, the estimate for the first quarter of 1956 may be short by an additional 20,000-25,000 bbl. daily.

The average of the product import figures filed with the commission shows a decrease for the first quarter of 1956, but the adjusted total is above the average for the first quarter of 1955.

Standard Oil Co. (N. J.) reported planned product imports using the average for the entire year. Since product imports for the first quarter normally run well above the average for the year, the first quarter total should be raised before the comparison is made.

Product imports by Jersey Standard averaged 47.3 per cent more in the first quarter of 1955 than the company's estimate for the entire year. If this ratio holds true for the first quarter of 1956, Jersey's imports for the quarter will be 79,900 bbl. daily higher than the average estimates for the year. The commission report shows a total for the quarter of 418,200 bbl. daily. If this is revised upward by 79,900 bbl. daily the adjusted average will be 498,100 bbl. daily compared with 492,000 bbl. daily reported for the first quarter of this year.

Reports to the Texas Railroad Commission do not account for all of products imported. Table 3 shows a com-

Here are Companies' Imports Figures

(Thousands of barrels daily)

	—Actual*—		—Estimated or forecast—				
	Oct.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
CRUDE—EAST COAST	1954	1955	1955	1955	1956	1956	1956
Atlantic Refining Co.	60.0	73.5	65.1	65.1	65.1	65.1	65.1
Cities Service Co.	13.1	28.9	40.5	16.3	26.9	23.8	28.1
Eastern States Petroleum Co.	9.7	6.8	20.5	20.5	20.5	20.5	20.5
Gulf Oil Corp.	121.0	152.0	128.0	136.0	130.0	130.0	130.0
McBride Oil & Gas Corp.	3.4	3.6	(¶)	(¶)	(¶)	(¶)	(¶)
Phillips Petroleum Co.	10.0	12.3	10.0	9.7	9.7	10.3	9.7
Sinclair Oil Corp.	63.6	73.1	73.5	73.5	69.0	69.0	69.0
Shell Oil Co.		1.8	1.9	2.0	2.2	2.3	2.5
Socony Mobil Oil Co.	80.9	66.9	66.0	63.0	64.0	64.0	64.0
Southwestern Oil & Refining Co.	7.3	3.6	3.7	(‖)	(‖)	(‖)	(‖)
Standard Oil Co. of California	70.8	83.7	78.0	78.0	78.0	78.0	78.0
Standard Oil Co. (Ind.)	16.1	21.7	12.9	18.0	9.8	14.0	13.1
Standard Oil Co. (Ohio)		1.5	3.3	3.2		1.8	15.
Standard Oil Co. (N. J.)†	85.0	74.0	79.0	79.0	79.0	79.0	79.0
Sun Oil Co.	7.3	23.6	24.9	28.1	27.2	27.8	27.3
The Texas Co.	37.0	59.7	69.2	75.6	65.5	65.9	62.9
Tide Water Associated Oil Co.	16.4	16.0	13.5	15.1	11.8	16.2	18.8
Total East Coast	601.6	702.7	693.5	690.2	665.8	674.8	676.6
CRUDE—WEST COAST:							
Shell Oil Co.		19.4	33.5	30.9	30.9	37.9	18.0
Socony Mobil Oil Co.	7.6	26.5	27.0	27.0	27.0	27.0	32.0
Standard Oil Co. of California	24.2	19.3	19.3	19.3	19.3	19.3	19.3
The Texas Co.	9.8	9.4	23.0	7.4	5.6	7.9	21.4
Tide Water Associated Oil Co.	12.9	17.9	30.3	35.6	51.1	51.1	51.1
Total West Coast	54.5	92.5	133.1	120.2	133.9	143.2	141.8
Total crude	656.1	795.2	826.6	810.4	799.7	818.0	818.4
PRODUCTS:							
Asiatic Petroleum Corp.	5.2	1.0	2.5	4.5	4.3	4.6	4.6
Eastern States Petroleum Co.	13.0	16.8	17.3	17.3	10.0	10.0	10.0
Gulf Oil Corp.	3.0	4.0	12.0	7.0	7.0	7.0	7.0
Shell Caribbean Petroleum Co.‡	117.0	82.0	145.0	153.0	168.0	172.0	145.0
Shell Oil Co.	11.5	18.0	21.4	16.1	28.0	24.1	24.3
Sinclair Oil Corp.		5.5					
Socony Mobil Oil Co.	9.7	10.1	13.3	13.3	10.2	10.2	10.2
Standard Oil Co. (Ind.)§	9.8	21.7	29.1	24.3	32.3	33.9	25.8
Standard Oil Co. (N. J.)†	159.0	128.0	187.0	187.0	169.0	169.0	169.0
Total products	328.2	287.1	427.6	422.5	428.8	430.8	395.9
Total crude and products	984.3	1,082.3	1,254.2	1,232.9	1,228.5	1,248.8	1,214.3
Bonded fuel included**	66.9	74.8	75.0	77.8	74.5	74.7	74.3

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. January, February, and March product imports are average estimates for 1956. ‡Imported by independent distributors. §Received through suppliers who can furnish either domestic or foreign oil. ¶Unreported by company but an average of 3,500 bbl. included in totals. ‖Unreported by company but an average of 3,600 bbl. included in totals. **Mostly duty free for bunkering ships in foreign trade.

TABLE 1

CRUDE IMPORTS*

(Thousands of barrels daily)

	1954	1955	Per cent change
First three quarters	639.9	740.4	15.7
October	656.1	795.2	21.2
November	626.0	826.6	32.0
December	720.2	810.4	12.5
Fourth quarter	667.9	810.6	21.4
Year	647.0	758.1	17.2

	1955	1956	Per cent change
January	716.8	799.7	11.6
February	747.3	818.0	9.5
March	721.4	818.4	13.4
First quarter	727.9	811.9	11.5

PRODUCT IMPORTS*

(Thousands of barrels daily)

	1954	1955	Per cent change
First three quarters	314.5	359.6	14.3
October	328.2	287.1	—12.5
November	414.2	427.6	3.2
December	485.1	422.5	—12.9
Fourth quarter	409.1	378.5	— 7.5
Year	338.4	364.4	7.7

	1955	1956	Per cent change
January	508.1	428.8	—15.6
February	519.0	430.8	—17.0
March	451.8	395.9	—12.4
First quarter	492.0	418.2	—15.0

*From reports to the Texas Railroad Commission.

TABLE 2

PRODUCT IMPORTS—FIRST QUARTER*
(Thousands of barrels daily)

	1955	Reported 1956	Adjusted 1956
January	508.1	428.8	
February	519.0	430.8	
March	451.8	395.9	
First quarter	492.0	418.2	498.1

*From reports to the Texas Railroad Commission.

TABLE 3

CRUDE IMPORTS—1955
(Thousands of barrels daily)

	Texas R.R. Comm.	Census Bureau	Difference
January	716.8	669.2	47.6
February	747.3	753.2	— 5.9
March	721.4	787.0	—65.6
April	669.4	693.9	—24.5
May	721.7	738.6	—16.9
June	779.6	817.6	—38.0
July	762.4	801.3	—38.9
August	748.2	844.7	—96.5
Eight months	733.2	763.4	—30.2

PRODUCT IMPORTS—1955
(Thousands of barrels daily)

	Texas R.R. Comm.	Census Bureau	Difference
January	508.1	617.0	—108.9
February	519.0	654.8	—135.8
March	451.8	589.4	—137.6
April	356.9	429.9	— 73.0
May	327.1	401.5	— 74.4
June	306.7	391.0	— 84.3
July	253.6	295.5	— 41.9
August	263.7	400.1	—136.4
Eight months	371.9	470.7	— 98.8

parison of both crude and products reported to the commission compared with averages tabulated by the Census Bureau. Note that the commission failed to account for 98,800 bbl. daily of products during the first 8 months of this year and that the difference was well over 100,000 bbl. daily in the first quarter.

Allowable Basis Revised

MEDICINE HAT, Alta.—Maximum daily production rate for gas wells in the Medicine Hat field has been set at 570,000 cu. ft. The Alberta Petroleum and Natural Gas Conservation Board said this will provide a 20-year, uniform life for the wells.

The allowable production formerly was set on an acreage basis. The full allowable was permitted only for a well occupying a 640-acre site. Others were scaled down proportionately. This created a problem because numerous wells here are situated on residential sites within the city limits.

The board assured residents of Medicine Hat that wells within the city limits would get full consideration for higher allowables if supply lines should freeze during winter months.

WATCHING WASHINGTON

Bertram F. Linz

Little Certain on Highways

The administration's huge highway-building program is more confused than ever.

Last session President Eisenhower asked Congress to approve a $101 billion, 10-year program to be financed by special bond issues. Congress didn't go for it. Instead, the Senate passed a bill based on a pay-as-you-go system. The administration bill got to the floor of the House, where it was defeated.

Commerce Secretary Weeks recently talked about the bill with the President. Afterward, he said the administration now leans to the pay-as-you-go idea and a less ambitious program. But he also said the administration next year may propose a combination of both cash and bond financing. And the program may be stretched out for 15 years.

Only one point remains certain. No matter how the new highways are financed, an increase in the gasoline tax is going to be needed. On a cash basis, the revenue would go into the pot with other funds. On a bond basis, it would be used to service the debt.

There are indications that the tax increase which it was proposed last year to impose on gasoline and tires may be extended to other items of similar road-using nature.

The oil industry supports the idea of highway modernization and extension. But it is against higher gasoline taxes to pay for it. The theory back of the tax proposal is that the users of the roads should pay for them. The oil industry argues that better highways will benefit the country as a whole, not just those who ride over them. So the Government's share of the cost should be met from general funds, not penalty taxes, it is contended.

House Investigators Eager

The House judiciary committee is anxious to get rolling on its probe of the National Petroleum Council and industry men who worked without pay in the Petroleum Administration for Defense.

So far, however, it hasn't received the information and reports it asked of the Interior Department some weeks ago. It has gone no further into the oil industry than to question Mobilization Director Flemming about the import program and the members of the Cabinet fuels committee staff.

Chairman Celler hopes to get into oil in a big way sometime during the coming month. He wants to question department officials about the roles played by the NPC and industry men in the making of government oil policies.

The committee is also expected to call NPC Chairman Walter S. Hallanan to explain the set-up and work of the council. And it is likely to call on men who served in the Oil and Gas Division and PAD. It is looking for cases where "conflict of interest" was settled in the interest of individual companies instead of the Government.

Price War Issue Grows

The fight against gasoline-price wars is getting hotter.

Small business committees of both House and Senate have been hearing from service-station operators. They have received many suggestions. One recommendation called for divorcement of retail facilities owned by major oil companies. Another proposed new antitrust laws. Others urged federal regulation of dealer leases.

There isn't much chance of any legislation next year, although bills are expected to be introduced in Congress. For one thing, the subject hasn't become so outstanding as to interest many congressmen. For another, an election year is the time to make political friends, not to start controversies.

But there may be action in another direction. The committees may put the pressure on the Federal Trade Commission to use the Robinson-Patman Act against price-cutters.

Since its case against Standard Oil Co. (Ind.), for price cutting in the Detroit area, the FTC has kept out of this field. It has held, in effect, that the Supreme Court decision in the Standard case tied its hands. Gasoline retailers argue that the decision, while upholding the right of the company to cut prices to jobbers who had received other offers, didn't apply to service-station operators who can't shop around.

Fuel limits force need for . . .

. . . Milder Auto Engine

PHILADELPHIA. — Designers must develop a future automobile engine better suited to the fuels available. Present engines can't make the best use of fuels that can be produced by practical refinery processes.

That was the kernel of technical discussions here among representatives of both the automotive and oil industries. They faced up to common problems at the annual fuels and lubricants session of the Society of Automotive Engineers.

Three sticklers were discovered confronting technicians in both industries: What to do about . . .

. . . **Increasing sensitivity** of high octane motor fuels.

. . . **Relative higher severity** of new automobile engines.

. . . **Formation of sludge** and deposits which also have a bearing on how well the new engines can use the new fuels.

The solution, according to three students of the problem, appears to be a new, very mild engine. Exploratory work barely has begun on such a possibility, reported P. C. White and A. P. Boyd of American Oil Co. (Texas) and J. D. Domke of Standard Oil Co. (Ind.).

Mild engines, as opposed to the current severe engines, were described as those which will show nearly the same octane requirements on the test block as in actual road operation. Late model engines were termed severe because their high octane requirements are in the high-speed range where sensitive fuels are penalized. Many of them also require a higher octane fuel after being subjected to road use.

Heart of problem . . . Sensitivity of high octane motor fuels is no new problem. The phenomenon is defined as the spread between research octane and motor octane ratings of a gasoline.

Refiners have watched this spread widen as they increased their catalytic cracking and reforming operations to meet new engine requirements. Often a jump in research octane was not accompanied by a similar increase in the motor octane number. They found that olefins and aromatics showed high sensitivity compared with straightrun fractions, isomates, and alkylates.

"Future gasolines are expected to have even higher sensitivities," White, Boyd, and Domke said. In their paper on future gasolines for future engines, they also noted that the more sensitive fuels showed a significantly greater loss of octane rating in actual operation.

This pinpoints the heart of the problem. Refiners are limited in their ability to produce gasolines of high motor ratings. They are geared for making large volumes of aromatics and olefins. Thus there is no practical relief in sight for the sensitivity problem.

What makes matters worse is the trend toward use of automatic transmissions. They raise the speed of maximum octane requirement and make gasoline sensitivity an ever increasing fuel liability.

Refiners are in a position to step up production of alkylates and isomates to a limited extent. But they currently have no processes permitting large volume production of these or other high motor octane gasoline components. It is economically out of the question to replace cat cracked and cat reformed blends with these highly expensive relatively little available components.

This would seem to toss the problem squarely back to the engine designers to turn out an engine to fit the fuel situation.

Additional points on the sensitivity problem were made by R. V. Kerley and K. W. Thurston of Ethyl Corp., in their paper on "The Knocking Behavior of Fuels and Engines." They presented a nomographic method for comparing the knocking characteristics of commercial automotive engines with relation to research and motor method engines.

The authors, through nomographs, compared sensitivity of different engines and showed the effects of various engine characteristics on relative severity. They noted that increasing the cylinder air density decreases engine severity. They verified findings of others that higher engine speeds had a very marked effect in increasing relative engine severity.

Some cases were cited in which increases in compression ratios of vehicle engines resulted in a decrease in severity. But they warned that much study is still needed on this point. The effects of compression ratio must be isolated from the accompanying changes taking place in volumetric efficiency, distributor settings, and cooling changes in the cylinder head and jacket.

And now sludge . . . The bulk of low temperature gasoline engine sludge is formed from the fuel rather than from the lubricant.

This is the conclusion of D. T. Rogers, W. W. Rice, and F. L. Jonach of Esso Research & Engineering Co. They discussed the mechanism of engine sludge formation and action of additives.

Their findings indicated that commercial combinations of detergent-inhibitor additives reduced sludge by inhibition rather than detergency-dispersion.

Nitrogen was spotted as the culprit in deposit formation. Studies of R. S. Spindt, C. L. Wolfe, and D. R. Stevens of Gulf Research & Development Co. showed that nitrogen fixation occurs during combustion. Engine varnish is the organic binder in engine deposits. And it results in large part from reactions of nitrogen dioxide with gasoline constituents.

They also named fuels rather than lubricating oils as the chief causes of deposits. Commercial engine oils generally are resistant to oxidation. Thus, it is likely that current deposit problems result from the nature of the fuel in combination with prevailing operating conditions. Average driving is at low temperature, and it appears that lean mixtures with consequent high nitrogen oxide content contribute much to formation of varnish.

Executives Wanted

But oil hopefuls must get a broad view to work from

G. L. Farrar

STILLWATER, Okla.—Who will be tomorrow's oil executives?

The door is wide open for the engineer who will train himself in handling people and managing money, and who will understand and assume his social and political obligations.

This is what M. L. Powers told engineers at the annual Oklahoma meeting of the American Institute of Chemical Engineers. Powers is director of business and industrial services at the University of Oklahoma, Norman.

Oil executives come from four sources, he said:

. . . **Men trained in business** administration often hold executive jobs because of their knowledge of money and general business procedures.

. . . **Lawyers** occupy many executive offices because of the complicated legal requirements of the oil business.

. . . **Men from the ranks** get top jobs, based on thorough knowledge of the operating end of the business.

. . . **Graduate engineers** are moving into management as the oil business becomes increasingly technical in its nature.

However, training in any one of these

four fields is not enough, Powers said. The oil executive must be able to lead people, be able to handle money and materials, and must have some understanding of the technical nature of the business.

The engineer is good raw material for an executive post, but he has a lot to learn and should get started his first day at work for an oil company, Powers said. He has the training and ability to analyze problems and make logical and orderly decisions. He has cost consciousness and fully understands the profit motive for business.

But he must make every effort to understand management philosophy and make it part of his own. He must learn that management decisions cannot be based on narrow technical considerations alone, but must be modified in the light of the people involved and the over-all effect on the business.

Specifically, the engineer who aspires to management must:

. . . Learn to analyze people in the same manner in which he can analyze problems.

. . . Understand money and money management. He must be able to handle money properly and make expenditures wisely.

. . . Recognize social activities as an important aspect of community life and contribute his time and talents to worthy causes.

. . . Be active in politics. The oil executive has an important stake in good government and his country's future.

There are many ways to develop in these fields, Powers said. Additional college courses are helpful. A program of self study is invaluable. A careful study of the methods of successful executives may be the most fruitful of all.

Demos May Back Harris Bill

WASHINGTON.—The Harris bill to exempt independent natural-gas producers from federal regulation stands a chance of becoming a basic part of the Democratic program for the coming session of Congress.

The bill was listed last week by Senate Leader Lyndon Johnson as one of 13 measures he will ask the Democratic Policy Committee to list for the session.

Johnson indicated the possibility of amendments in the measure approved by the House last session. He said it should provide protection for consumers.

Other subjects on Johnson's list included liberalization of the social security act, tax revision, and a big public roads program.

Orthoflow Fluid Cat Cracker Takes Shape

This huge Orthoflow fluid catalytic cracking unit is now going up at Tide Water Associated Oil Co.'s new 130,000-bbl. per day refinery at Delaware City, Del. At left is the steel skirt for the reactor vessel which will be capable of charging 102,000 bbl. per day of fresh feed and recycle. In the foreground are the fabricated sections for the 250-ft. vessel. The octagonal structures, center, will support the regenerator and catalyst-storage vessels.

Rangely Field Orders Canceled

DENVER. — An irate Colorado Oil and Gas Commission last week canceled all orders governing production in Rangely field.

"Since there is a question our power is entirely uncertain and doubtful, we have agreed to rescind all orders on Rangely," Chairman Warwick Downing declared. He cited a May decision of the state Supreme Court voiding the commission's order for reinjection of gas in Rangely.

Downing said he will ask Gov. Ed C. Johnson to include the subject of oil conservation in his call to the legislature convening January 4.

Downing said he prefers to have the law changed instead of having a drawn-out court fight. Litigation could stretch over a 2-year period, he said.

Downing said the May court decision stripped the commission of power to "directly or indirectly" order reinjection of gas into Weber reservoir. The commission was trying to end flaring and encourage a complete reinjection program for the sake of conservation.

Among the canceled Rangely orders was one limiting daily production to 300 bbl. per well.

The commission acted after a hearing on the amount of oil to be taken from Weber wells and the flaring of natural gas.

Downing blasted "willingness of oil companies to fight at a drop of a hat" and charged they "simply would not cooperate."

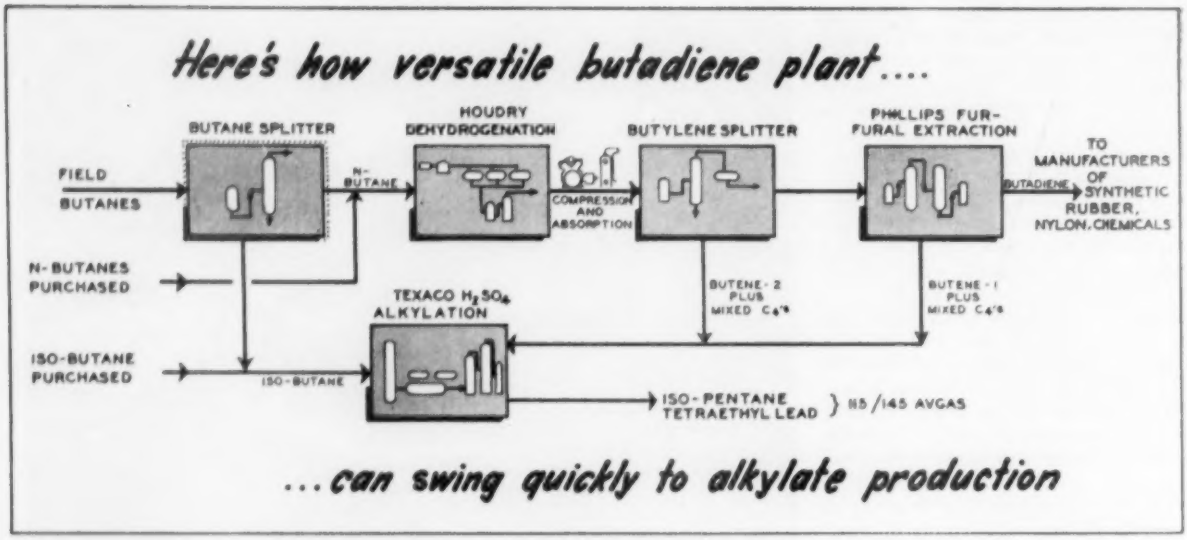
Oklahoma Hikes Allowable

OKLAHOMA CITY.—The Corporation Commission has approved a 15 per cent increase in Oklahoma's oil-production allowable the next 2 months, but not without misgivings.

The order set up a 25-bbl. daily minimum, on a lease basis for unallocated wells, and on a per well basis for allocated wells. It represented a victory for independents.

The commission said the action should result in December and January production of 582,000 bbl. per day. Some concern was expressed when output the third week of November was reported at 588,031 bbl. But Massena Murray, state conservation director, expected the fourth-week slack to drop the month's average to around 571,500 bbl. per day.

Commissioners said a special hearing would be called next month if the situation got out of hand. Texas earlier hiked allowables some 90,000 bbl. in anticipation of a cutback in imports.



Texas Plant Shoots for Double Payout

- **Texas Butadiene & Chemical stakes long-range future on supplying basic materials for petrochemical industry**
- **But avgas also will play important role in $26-million plant since alkylate components are process byproducts**

Larry Resen

HOUSTON.—Butadiene at the front door. Avgas at the back. That, basically, is the story of Texas Butadiene & Chemical Corp.

The company currently is building a $26-million plant in the Houston area with enviable economic prospects. It will turn out two end products both of which have bright market outlooks. What's more the byproducts of the process for one supplies a feed stock for the other.

The plant is set up primarily as a butadiene producer *(The Oil and Gas Journal, July 25, 1955, page 142)*. T.B.C. officials determined after long research that this basic chemical will have an increased demand in the years to come. It is a prime raw material in the production of synthetic rubber and other petrochemicals.

But these officials also noted that the process produced isobutane and butylenes, the basic ingredients of alkylate. Thus production of alkylate and avgas loomed as a natural—with reservations.

How it's done . . . Field butanes, rather than refinery gases, will serve as the primary raw material at the plant.

The isobutane will be split out of the charge. N-butane then will be fed into a Houdry Process Corp. dehydrogenation unit, resulting in the direct production of butadiene. Some butylenes are also produced in the process.

With isobutane and butylenes as byproducts of feed preparation and butadiene production, alkylation became a sound route to follow. More important it could be integrated economically with the main process.

T.B.C. officials, however, emphasized present costs make it economically unsound to operate the plant primarily for alkylate. They believe that alkylate demand is increasing. But it will level off before long and remain on a high plateau for perhaps 5 years until the full impact of the new engines is felt in aviation and automotive industries.

This outlook coincides with industry observations for alkylate *(The Oil and Gas Journal, October 31, 1955, page 58)*. It makes alkylation valuable only as an adjunct to the butadiene operations and provides a wider base and increased flexibility during T.B.C.'s early years.

Advantages in supply . . . One key feature of the T.B.C. operation is use of widely available field butanes instead of butylenes produced primarily in off gases from refinery catalytic cracking units.

Output of these refinery B-B streams is geared substantially to refining runs, with their resultant limiting factors. This caused butylenes to be diverted from synthetic-rubber plants into alkylation units on occasions during World War II and the Korean War. Current demand for these B-B streams remains high. So by taking the dehydrogenation route an entirely new source of butadiene and butylenes is provided.

T.B.C. approached the Government with these facts and won a facilities contract from the Armed Services Petroleum Purchasing Agency. This was awarded as part of the defense program for expanding the nation's alkylate-avgas capacity. T.B.C.'s position was bolstered further with a certificate of necessity from the Office of Defense Mobilization, permitting rapid amortization of the plant investment.

Location of the new plant presented management with a serious decision. West Texas at first appeared inviting. The area has numerous small and large field processing plants turning out L.P.G. Locations removed from the southwest along the Mississippi River also were considered. The Gulf Coast, however, finally won out. Its advantages are a heavy concentration of petrochemical and synthetic-rubber plants, available raw materials plus water transportation facilities. The plant was located 20 miles northeast of Houston on the San Jacinto River.

Details of process . . . In its operations, T.B.C. will stick principally to basic processes.

An input stream of field butanes will be charged to a butane splitter. Isobutane will be fractionated out. This will leave n-butane for feedstock to the butadiene units. If n-butane is avail-

able, the butane splitter may see little use. Isobutane then will be purchased as necessary for the alkylation unit.

N-butane charged to the Houdry dehydration unit will undergo conversion directly to butadiene and assorted C_4 fractions. This output stream will be compressed and absorbed before being charged to a butylene splitter. Here butene-2 will be removed.

The raw butadiene cut will then be charged to a Phillips furfural unit where selective extraction of butadiene will be made, removing butene-1 and associated iso-C_4.

The charge to the alkylation unit, consisting of butylenes and isobutane, will be fed into a sulfuric acid unit licensed by the Texaco Development Co. Stratford Engineering Co. reactors will be used, and their effluent refrigeration process will be employed.

Build by stages . . . Construction has been planned in a two-phase program. This is primarily for convenience and timing.

The plant is geared basically to produce 86,000 tons of butadiene per year. This has been split for the initial phase of the first half of the plant now building. It will be operated to make 17,000 tons of butadiene and 2½ million gallons per year of 115/145 finished avgas.

The product distribution can be varied. The operators can drop avgas output to zero and step up butadiene production to 43,000 tons per year. However, the Government's requirements for avgas will determine the exact pattern of operation.

Work began in mid-August on the first phase of the program. Completion is expected by October or November 1956.

Design engineer and contractor for the plant is Fluor Corp., Ltd. The job is laid out so that actually a major portion of the second half of the plant also is being built now. A few key towers, vessels, and dehydrogenation reactors can be added later. They will increase possible butadiene production to 86,000 tons per year. In the fast-stepping petrochemical industry, it's conceivable that the entire plant could be completed by next fall.

When all facilities are installed, plant capacity will allow three possibilities:

. . . A maximum of 86,000 tons of butadiene and no alkylate.

. . . 60,000 tons of butadiene and 2½ million gallons of avgas.

. . . Any combination upward from 60,000 tons of butadiene and downward from 2½ million gallons of avgas.

People involved . . . Management personnel of T.B.C. include E. L. Green, Jr., president; K. D. Bowen, vice president and general manager; Dr. C. A. Stokes, vice president and technical director; J. R. Kerby, comptroller; and C. E. Leach, director of industrial relations. Largest single stockholder in the enterprise is Godfrey L. Cabot, Inc., Boston carbon-black manufacturer.

These men are charting T.B.C.'s future for a high volume producer of butadiene for sale as a raw material to synthetic rubber and petrochemical plants. They think further developments may cause the company's base to be broadened to make other new olefin and di-olefin products.

Record Stretched

Louisiana well goes below 22,000 ft., still drilling

PORT SULPHUR, La.—The deepest hole ever drilled passed 22,000 ft. early November 23.

It was still drilling ahead and the operator had no immediate plans to bottom the hole or attempt completion. An electric log had been run at 21,605.

The well is the 1 LL&E Humble "L," being drilled by an old barge-mounted steam rig. It is 3 miles east of production in Lake Washington field and about 35 miles southeast of New Orleans.

The operator is Richardson & Bass, Fort Worth. Also in the venture are John Mecom, Houston independent, and Freeport Sulphur Co., Houston.

At 22,000 ft., the hole was 518 ft. deeper than the previous record set in 1953 by Ohio Oil Co. in Kern County, California.

Nebraska Association Talked

SCOTTSBLUFF, Neb.—Members of Nebraska's oil industry are studying a proposal calling for organization of the state's first oil and gas association.

The proposal was advanced by W. F. Rogers of Scottsbluff, president of Rogers Oil Co., at a meeting of operators —mostly independents—here. The need for an association was pointed up, Rogers said, when he testified before the last session of the state legislature on oil and gas bills.

Named to a committee to draft plans for an association were Fred Johnson, Harrisburg; Glenn Wallace, Hastings; Ray Smith, Chappell; S. E. Torgeson, Kimball; R. B. Laughlin, Casper, Wyo.; J. H. McNish, J. W. Gee and Paul Martin, all of Sidney, and Rogers. Laughlin represented Stanolind Oil & Gas Co., and Gee was spokesman for Ohio Oil Co. Other members are independents.

Industry Briefs

CASPER, Wyo.—Work on the Wyoming portion of the Pacific Northwest Pipeline Corp.'s natural-gas line was completed last week by the A. J. Curtis Construction Co., Casper, Wyo. The Curtis firm built 82.8 miles of 22-in. line from Green River to Sage where the tie-in with the section to Lava Hot Springs, Idaho, will be made.

The Curtis contract totaled nearly $2,500,000. Before starting on the Wyoming section, the company built a 56-mile, 16-in. lateral to the Big Piney area and 31 miles of gathering system in that vicinity.

WASHINGTON.—Central Kentucky Natural Gas Co. has been granted permits to build $2,474,100 in pipeline facilities to meet increased demand in the Cincinnati area. Projects included in the Federal Power Commission approval were 14.2 miles of 24-in. line from Cold Springs to Anderson Ferry, Ky.; crossings on the Licking and Ohio rivers; and 6.9 miles of 20-in. loop from Means compressor station to South Means, Ky.

HOUSTON.—Stockholders of Texas-Ohio Gas Co. have voted to change the name of the firm to Colonial Natural Gas Corp. The reorganized company has completed market surveys for a proposed gas pipeline from Louisiana and Texas fields to southeastern Georgia and Florida. A subsidiary, North Carolina Natural Gas Corp., also has applied for a permit to serve 17 cities in that state.

WHITE PLAINS, N. Y.—Tennessee Gas Transmission Co. has started delivering natural gas from Texas into metropolitan New York mains. The flow is routed here through lines across northern New York state, down through New England and across the Connecticut-Westchester county line.

REGINA.—The Department of Mineral Resources of Saskatchewan has announced a lease sale for December 14. Bids will be taken on petroleum and natural-gas rights on 17,280 acres in three blocks of land in the south-central portion of the province.

WINNIPEG.—The Winnipeg & Central Gas Co. has contracted to deliver 57,000,000 cu. ft. of natural gas annually for 20 years to the Canada Cement Co. plant at Fort Whyte, Man. The deal is based on ability of Trans-Canada Pipe Line Co. to deliver 200,000,000 cu. ft. of gas to the Winnipeg market in the next 20 years.

Two-Year Raise Sought

O.C.A.W. won't say how much it wants, but it's directing its locals to demand "substantial" boosts in negotiations

DENVER.—The wage drive being pushed in the oil and allied industries by the C.I.O. Oil, Chemical and Atomic Workers International Union is aimed at securing increases for 2 years—1955 and 1956.

When the 10-cent wage boost was accepted last March, the union's bargaining policy committee and its president—O. A. (Jack) Knight—said they considered that boost one which was due in 1954 but received in 1955.

"Therefore," Knight said last week, "the position of the union is that oil workers have not received a 1955 round of wage increases and are now in negotiations for a wage increase earned and due in 1955, plus 1956 increases which will be due soon."

The campaign was launched immediately following a meeting of the 54-member bargaining policy committee in Kansas City November 12-13 *(The Oil and Gas Journal, November 21, page 132)*. Included are 500 bargaining units representing more than 100,000 union workers.

Amount indefinite . . . The amount to be sought in cents-per-hour or percentagewise was not disclosed. The committee said only that bargaining units were to demand "substantial" increases, indicating they would be larger than those placed on the bargaining tables in previous years. No floor or ceiling has been established.

Bargaining units have been instructed to report to the union president "any wage increase offers of consequence" received from any employer.

"This will bring about a unity of action which will prevent any one bargaining group from inadvertently signing a contract for an inferior wage increase and possibly setting thereby an industrywide pattern lower than could otherwise be set," Knight declared.

Productivity of the oil workers will be the chief argument in negotiations, Knight said.

Other demands . . . The industry can also expect demands for upgrading of wages paid in higher classification jobs where, according to O.C.A.W., pay rates "are out of line with top classifications of workers in other industries."

The policy committee contends, too, that substantial improvements are due in fringe benefits.

"In many industries, fringe benefits have been improved substantially during recent months," the committee stated. "Improvements in vacation pay, hospital and surgical benefits, pensions and the negotiation of the guaranteed annual wage in the automobile industry have provided for the workers in these other industries advantages and benefits which are not now available to the fullest extent to workers in the petroleum industry."

Most of O.C.A.W.'s approximately 500 contracts with oil companies contain a provision allowing them to be opened for wage negotiations by January 1, 1956. Nearly all of the remainder can be reopened by the spring of 1956.

Imports, Exports Show Decline

BOTH imports and exports declined in September and by almost equal amounts.

Total imports for the month averaged 1,212,000 bbl. daily for a decrease of 33,000 bbl. daily from August. Exports, including shipments to territories, averaged 325,000 bbl. daily, down 35,000 bbl. daily from August. Net imports increased 2,000 bbl. daily.

Crude imports amounted to 826,000 bbl. daily, a reduction of 19,000 bbl. daily from the all-time record set in August. The slight decrease of 14,000 bbl. daily in imports of products is more significant since they normally start gaining about September of each year.

Crude imports from Canada and Qatar set new records in September. This was the seventh consecutive monthly record for the crude from Canada. Increased runs at new refineries both on the West Coast and in the Great Lakes area account for the continuing gains for Canadian crude.

Total receipts from Canada in September averaged 61,500 bbl. daily with 44,500 bbl. daily for refineries in the Pacific Northwest. The remaining 17,000 bbl. daily went to North Dakota and the Great Lakes area. Qatar averaged 28,600 bbl. daily in September. The previous record was set in June with 25,400 bbl. daily.

The district division of total crude in September was: East Coast, 639,800 bbl. daily; Gulf Coast, 55,900 bbl. daily; West Coast, 112,800 bbl. daily; and 17,000 bbl. daily for the Great Lakes area and North Dakota. The refinery in Puerto Rico imported 13,300 bbl. daily from Venezuela, which is not included in the United States total.

Residual imports dropped 47,000 bbl. daily but all except 14,000 bbl. daily of this decrease was offset by gains for other products. Gasoline imports averaged 35,400 bbl. daily, much higher than normal.

The decrease in exports was general. Distillate was the only product with a higher average than in August. Shipments of residual decreased 11,000 bbl. daily while crude exports were down 10,700 bbl. daily.

Compared with last year, exports gained 162,000 bbl. daily, but most of this increase is due to the fact that shipments were abnormally low in September last year.

IMPORTS INTO CONTINENTAL U. S.

(Thousands of barrels)

	Sept. 1955	Oct. 1955	Sept. 1954
Crude—			
Mexico	803	425	587
Colombia	491	616	900
Venezuela	11,907	13,118	11,410
Peru			125
Ecuador	72	71	110
Trinidad			
Kuwait	4,397	4,191	3,221
Saudi Arabia	2,374	2,577	2,448
Neutral Zone		333	
Iraq	652	1,131	391
Iran	395	208	
Qatar	858	620	130
Canada	1,846	1,593	67
Far East	968	1,302	994
Total crude	24,763	26,185	20,383
Daily average	826	845	679
Products—			
Residual fuel	9,126	10,907	8,206
Other products	2,463	1,497	1,231
Total products	11,589	12,404	9,437
Daily average	386	400	315
Total all oils	36,352	38,589	29,820
Daily average	1,212	1,245	994

EXPORTS*

	Sept. 1955	Oct. 1955	Sept. 1954
Crude	832	1,191	509
Gasoline	2,269	2,481	2,265
Kerosine	144	295	250
Distillate fuel	2,179	2,170	1,525
Residual fuel	2,241	2,656	1,565
Lube oils	1,148	1,227	973
Other products	938	1,141	792
Total all oils	9,751	11,161	7,879
Daily average	325	360	263

*Excludes shipments to territories.

New additives are promising . . .

. . . Better Cement Jobs

J. O. Scott

TULSA. — Better—yet cheaper—cementing jobs are being obtained in some areas through the use of new cement additives.

When used singly or together these additives can:

. . . **Reduce density** of the cement to as low as 10.5 lb. per gallon, which will permit matching the weight of the cement with the weight of the mud in the hole.

. . . **Reduce water loss** from the cement.

. . . **Slow down thickening time,** a particular advantage at high temperatures.

Two principal additives are a diatomaceous earth, used to lower the density, and carboxymethyl hydroxyethyl cellulose, which both reduces water loss and retards thickening. These may be used together or separately.

A third additive, a sodium silicate, may be used with the cellulose additive. This combination is used where a reduction in water loss is desired but where high early strength is needed.

The combination is ideal for wells having low bottom-hole temperatures. If only the low-density additive is used, calcium chloride may be added to obtain high early strength.

Field tests successful . . . More than 200 field tests have been made to determine the value of the new cements.

Test depths have ranged from 2,000 to 16,500 ft. Results have shown that the cements perform as well or better than other cements now in general use, according to Drilling Specialists Co., Bartlesville, Okla., which markets the products, and Halliburton Oil Well Cementing Co., which is handling the additives as a part of its regular cementing service.

Until just recently, the new cements had been limited to laboratory and controlled field tests *(The Oil and Gas Journal, September 20, page 107).*

The additives are now available generally under the trademark Diacel.

Western Kansas is one area where the cements have performed well. Operators there are plagued with serious casing corrosion and high maintenance costs due to percolation of corrosive Dakota formation waters into the poorly cemented annular space behind the casing.

In normal cementing in this area, it is difficult to fill this space. Many formations break down under high hydrostatic pressures during cementing.

Use of the low-density additive has made it possible to circulate the cement, since its weight is only about that of drilling mud. With the 11-lb. per gallon slurries, no cement has been lost during placement.

Fill-up has been so good, in fact, that adding 5 per cent to the calculated hole volume usually results in cementing all the way to the surface.

Cost is less . . . Low cost is one of the big advantages of the diatomaceous earth cements.

For example, an 11-lb. per gallon slurry will cost about $0.88 per cubic foot. A 15.5-lb. neat slurry would cost about $1.26 per cubic foot, while an 8 per cent gel cement would cost about $0.97 per cubic foot but would have a density only as low at 13.3 lb. per gallon.

Where a water loss of about 10 cc. is desired, the cement cost would increase by $0.40 to $0.60 per cubic foot of slurry. Low water loss can be obtained with all cements ranging from neat to 40 per cent diatomaceous earth.

What's involved . . . Halliburton premixes the additives and cement in special blending equipment to insure a uniform slurry for any particular job.

The additive mixture may be different for each job, depending upon the density desired and whether the operator wants low water loss or a slow-setting cement. After the desired blend is made, the bulk cement mixture is trucked to location by regular dry-bulk cement trucks.

At the well site, the blend of cement and Diacel additives is mixed with water as in a regular cementing operation. The only needed precaution is to control closely the density of the slurry as it is pumped into the well.

Trade names of the new additives are: Diacel D, the diatomaceous earth; Diacel LWL, the carboxymethyl hydroxyethyl cellulose; and Diacel A, the sodium silicate.

Indiana Drills Well in Wabash River

EVANSVILLE, Ind. — An unusual drilling operation on the Wabash River is the center of a controversy between the State of Indiana and major companies in New Harmony Consolidated field.

Oil has been found in the State of Indiana E-62.5A, in Posey County, drilled by C. R. and C. A. Lynch as contractors. They plan to move the drilling barge 660 ft. south to the second of six locations approved by the state.

Indiana is going ahead with operations in the face of three lawsuits to block the program. Tide Water Associated Oil Co. has filed a state court suit and another in the federal courts. A second federal court suit seeking an injunction against the state has been filed by Continental Oil Co.

Indiana said it is drilling to prevent drainage from the state-owned river bed, and to get revenue from the oil which it claims rightfully belongs to the state.

The E-62.5A offsets six-pay production on the river bank. Four-in. casing was set at 2,795 ft. Contractors said oil will be produced from the Biehl, Tar Springs, upper and lower Cypress, Benoist, and Aux Vases sands.

Texans' $150-million project first . . .

. . . Major Offshore Lines

HOUSTON.—The world's first major underwater pipelines are being planned to transport oil and gas produced in fields in the Gulf of Mexico off Louisiana.

The Offshore Gathering Corp. of Houston has filed an application with the Federal Power Commission for certificates of necessity. It proposes to build two submarine lines—a 30-in. gas line and a 20-in. crude line.

David C. Bintliff, president of Offshore Gathering, estimated cost at $150,000,000.

Two-way flow . . . Exact route of the the lines has not been determined. But in general they would roughly parallel the Louisiana coast about 25 miles from shore.

The lines would start at the Texas side of the Sabine River, south of Port Arthur, and extend south of Louisiana to the Mississippi side of the Pearl River. The company proposes to lay gathering lines to tap nearby oil and gas fields on each side of the main system.

If approved by the FPC, the gas system will have an eastward flow, moving gas from offshore fields to Mississippi for transmission through onshore facilities.

Crude would flow both directions through the 20-in. line, paralleling the larger carrier. In this manner, the line could serve the big Port Arthur refining center while delivering surplus crude to the Mississippi River or to other points near the eastern terminus.

Capacity of the gas line was set at 300,000,000 cu. ft. daily. The first 60 miles would be of 24-in. pipe. The next 70 miles would be 26-in., and the last 234 miles 30-in.

There would be no compressor stations. A processing plant is planned at the eastern end on the Louisiana-Mississippi line. Addition of compressor stations could double the initial capacity.

The main line would have 8 and 10-in. laterals running seaward as far as 80 miles. Individual wells would be tied in by 4 to 6-in. sublaterals.

Carrier needed . . . At present there are about 17 oil fields and 16 gas fields in the area to be served by the twin lines. Many of the offshore wells are shut in for lack of transmission facilities.

Crude produced from Louisiana's offshore area now averages about 81,000 bbl. daily. A big portion of it is moved to shore by barge. Most offshore gas wells are shut in.

The newly organized corporation has signed no contracts as yet for delivery of production from any present or potential offshore fields.

The proposed pipelines would be about 364 miles long, by far the longest ever built under water. The longest submarine pipeline to date is a 48-mile gas and oil line off Eugene Island, Louisiana. It is owned jointly by Magnolia Petroleum Co., Continental Oil Co., and Newmont Oil Co. *(The Oil and Gas Journal, June 27, page 78).*

That carrier is a 12-in. line put into operation only last summer. It is unusual because it is one of the first pipelines to pick up both oil and gas from several fields. It runs on a dogleg route from Burns Terminal to the most distant production found on the Continental Shelf.

Bintliff said the cost of the project will be financed by a syndicate headed by Salomon Bros. & Hutzler, New York.

Officials are unable to estimate when construction of the gathering lines will start. It must be held up until the gas line is approved by the FPC. Further delays may result while contracts are negotiated with offshore producers.

Who's behind move? . . . Once approval and necessary contracts are obtained, it would require about a year to construct the lines. One spokesman expressed the hope that the lines might be in service sometime in 1957.

Offshore Gathering Corp. was organized in Delaware. Its proposal has been in the engineering stages about a year.

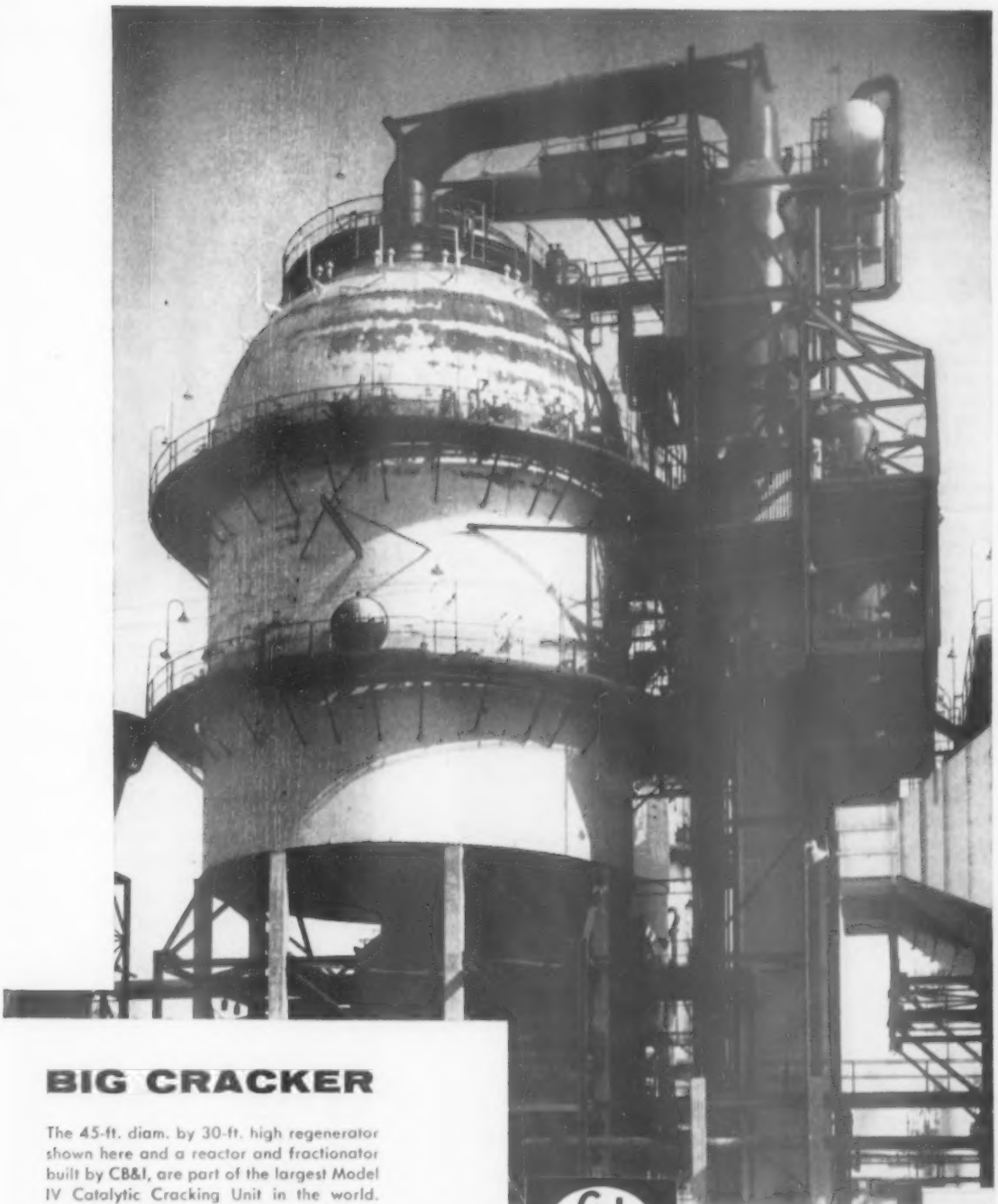
Bintliff is a Houston financier with oil, real estate, and other interests.

David T. Searls, vice president and secretary, is a member of a Houston law firm serving as legal counsel for the company. E. O. Bennett, of Petroleum Consultants, engineers and consultants for the project, is a director of the company.

Other directors include Jack G. Taylor, of David C. Bintliff Interests, who also is treasurer and assistant secretary; J. H. Mosser, president of Associated Oil & Gas Co.; and Daniel C. Arnold, Houston attorney.

Barge Designed to Operate in 75-Ft. Water

Recently launched by Avondale Marine Ways, Inc., at New Orleans, this submersible drilling barge will go to work for The California Co. in the Gulf of Mexico early next year. It was designed by Friede & Goldman, Inc., New Orleans naval architects and marine engineers, and is capable of operating in 75 ft. of water. As high as a 10-story building, the vessel is said to be the largest marine steel structure with respect to height and beam ever launched at New Orleans. When completed, it will have a 150-ft. beam. Since this is too great for launching from conventional shipbuilding ways, the vessel is being built in units. Beam of the main hull as shown is 90 ft., and two additional hull members each 30 ft. wide will be added later. Over-all length of the barge is 190 ft. Height from the keel to bottom of the lower deck is 90 ft. The vessel will be equipped with a 1,000,000-lb. lift, four-hole derrick.



BIG CRACKER

The 45-ft. diam. by 30-ft. high regenerator shown here and a reactor and fractionator built by CB&I, are part of the largest Model IV Catalytic Cracking Unit in the world. Furnished through the Fluor Corporation, Ltd. for the Standard Oil Company of California's refinery at El Segundo, California, it has a design capacity of 40,000 B.P.D. The reactor was field stress relieved and X-rayed as was the lower 21 ft. 9 in. shell and bottom head of the fractionator which is clad with 12 per cent chrome.

When planning additions, or a new refinery, write Chicago Bridge & Iron Company for information on welded steel plate structures.

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Pipe Supply Tightens

Mills are as much as 3 months behind on deliveries but oil men still don't fear a cutback in drilling in 1956

Gene T. Kinney

TULSA.—The supply of oil-country tubular goods is tighter than it has been since the paralyzing steel strike of 1952.

This is the picture:

. . . **Mills** are 30 to 90 days behind schedule. Fourth-quarter deliveries won't be completed until January, cutting first-quarter supplies to two-thirds of requirements.

. . . **Supply houses** are turning down business right and left. Many are rationing regular customers and turning down new ones.

. . . **Outlook,** supply men report, is for the strain to build up under pressure of the 2 to 3 per cent increase in drilling expected next year *(The Oil and Gas Journal, November 14, page 118).*

The shortage is particularly acute on high-pressure pipe and small casing. One supplier described the 2-in. tubing situation as "pathetic."

The mad scramble for pipe and the prospect for little increased tonnage have caused some concern about the 1956 drilling program. Oil men are beginning to wonder if there will be enough steel to drill the more than 50,000 wells which are planned next year.

The trouble . . . One of the big reasons for the current shortage is the drilling spurt which the industry put on the last half of 1955.

Many programs were suddenly upped 5 per cent at midyear, and the mills have been trying to catch up with demand ever since.

"We're definitely out on a limb," one supply company said. "We can't see any possibility of catching up during 1956, even with our new capacity. Our customers are having to scrounge for pipe now and will be all next year."

Foreign pipe is almost always available at a price. But even that will be limited. The generally high level of drilling worldwide has European and Japanese mills in about the same shape as those in the United States.

Some suppliers suspect that part of the abnormal demand results from overbooking by major companies. The suppliers are holding back pipe for independents, who never know their requirements as far ahead as the big companies.

Other supply firms insist that there is no padding of orders, scare buying, or buying to beat a price increase which has been rumored after the first of the year. They say that while orders are abnormally heavy, oil companies are merely buying their requirements and building up inventories depleted by the 1955 drilling spree.

Effect on drilling . . . The effect, if any, on next year's drilling remains to be seen.

While the industry recognizes the situation as potentially dangerous, almost everybody has an optimistic view.

A Journal survey of suppliers and operators, large and small, failed to turn up anybody who definitely believed a single well would go undrilled next year for want of tubing or casing.

Oil men point out they have been in and out of tight spots since the beginning of World War II. Except for unusual situations like the 1952 shutdown, they have always been able to beg or borrow enough pipe to complete their wells.

As a result, there is the general feeling that "something will turn up." The sentiment was expressed this way by one operator:

"Sure, pipe is hard to find, but we've seen it that way before. A year ago the supply houses were coming to us, trying to sell us. Now they're trying to keep us happy on less than we think we need. But the pipe is definitely there.

"The difference now is that you have to hunt for it. You may have to go to four or five places to find what you want. And you may have to settle for a different specification. But we don't expect to stack any rigs because of a tubular goods shortage."

Getting Both Sides of the Story

Landscaping in typical southern California motif greets Highway 101 motorists as they approach the Monterey Oil Co.-Humble Oil & Refining Co. Newport Beach drilling location on the northwest edge of the resort city (left photo). Hidden from the motorists' view are 10 producing wells (right photo). Just the mast of the big drilling rig is visible from the highway, which runs along the beach. The wells are producing more than 1,000 bbl. daily. The wells are bottomed under the Pacific Ocean.

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Producers Ask for Crude Hike

WICHITA FALLS, Tex.—The North Texas Oil and Gas Association has asked major oil purchasers to pay 50 cents a barrel more for the oil they buy.

Letters urging such action have gone to Cities Service Oil Co., Continental Oil Co., Gulf Oil Corp., Humble Oil & Refining Co., Magnolia Petroleum Co., Phillips Petroleum Co., Shell Oil Co., Sinclair Oil Co., Stanolind Oil Purchasing Co., and The Texas Co.

D. C. Norwood, president of the North Texas producers group, said the association's board of directors decided unanimously to seek a crude-price hike after studying closely all arguments for and against.

In his letter to the oil purchasers, Norwood cited price increases in steel, services, and wages ranging from 10 to 13 per cent since 1953—this while the price of oil remained stationary.

North Texas operators are convinced from local experience, Norwood said, that their costs have risen over 50 cents a barrel since the last price increase.

The Wichita Falls oil man said the association realized that an increase in North Texas would mean a general raise over the United States and a corresponding increase in products prices.

"However, if we are to develop the crude oil necessary to meet our rising demand in this country and to provide some reasonable margin for national security, the necessary incentives must be provided. The duty of providing such incentives must fall on the purchasers of our crude oil."

LOS ANGELES.—The president of The Oil Producers Agency of California has warned members that state crude-oil production cannot be maintained at 1,000,000 bbl. daily unless "economic factors" are recognized.

R. R. Von Hagen, head of the agency, told members in a letter that rising costs and lower revenue were about to form a trap that would capture producers if corrective measures weren't taken soon.

California production was built up to and maintained at 1,000,000 bbl. daily in 1953. To achieve this, producers drilled 2,575 wells, totaling 11,350,000 ft., or an average of 4,400 ft. per well. To maintain the million-barrel average in 1955, Von Hagen said that 2,880 wells averaging 4,600 ft. or a total footage of 13,248,000 would be needed.

The letter pointed out that this is an increase of 17 per cent from 1953 to 1955 and that the footage required to maintain the 1,000,000-bbl. rate would not be drilled this year.

Von Hagen said this year's gross production revenue per foot drilled would be $75.72. And if the footage required to maintain production were drilled, the revenue per foot would be $68.87.

In 1953 producers had a per foot gross revenue of $80.08. Crude prices would have to be jumped from the present average of $2.52 to $3 if the 1953 per foot revenue were to be maintained for 13,248,000 ft.

Trans-Canada Leaps Big Hurdle

OTTAWA.—The Ontario and dominion governments have formally agreed to build the uneconomic portion of the Trans-Canada pipeline crossing northern Ontario.

The action removes a major obstacle blocking the construction of the proposed 2,250-mile line from Alberta to Montreal. The last big hurdle is approval by the Federal Power Commission for Tennessee Gas Transmission Co. to import 200,000,000 cu. ft. of Alberta gas daily for sale in the U. S. Hearings will begin December 12.

The provincial and federal governments agreed to put up the money for the 675-mile segment to extend the line from Manitoba to major eastern markets. Private financing could not be arranged. Ontario will provide one-third of the cost, but no more than $35,000,000.

Trans-Canada Pipe Lines, Ltd., is expected to spend $230,000,000 building the rest of the line, and it has until May 1 to show financial ability.

The company is scheduled to offer some $30,000,000 worth of common stock for public sale with over 50 per cent to be taken up in Canada. Canadian Gulf Oil Co., a major gas supplier for the line, is reported to be a strong candidate to become a shareholder. Tennessee Gas has just become a one-third partner in the huge project.

The crown-company section will be leased to Trans-Canada for a maximum of 25 years. Trans-Canada is to purchase the government portion as soon as possible. The company will pay all operating costs and maintenance expenses, plus the rental. The governments will make additions of integral parts to their segment but that is all.

This link will be designed for initial capacity of 300,000,000 cu. ft. daily. Ultimate capacity is to be 530,000,000 cu. ft. without looping.

Processing Briefs

LOS ANGELES.—Brea Chemicals, Inc., a subsidiary of Union Oil Co., and Koppers Co., Inc., plan to build and operate a Ziegler-type polyethylene plant on the West Coast. Koppers is preparing the process design. A joint engineering team is working out details of location and operation. The plant will have a capacity of 50,000,000 lb. per year. It will be in operation in 1957.

TACOMA, Wash.—Site preparations have begun on U. S. Oil & Refining Co.'s 15,000 bbl. refinery here. Completion of the new installation is set for late next year. When this plant is put on stream it will give Washington its third refinery in the last 2 years.

Dr. Ernest E. Lyder, president of the firm, said the plant would produce gasoline, diesel, stove, and fuel oils and aviation fuels. John Ford, Los Angeles, is in charge of construction. Products from the refinery will be marketed by Time Oil Co.

TULSA. — Stockholders have approved sale of Bareco Oil Co.'s Barnsdall, Okla., wax plant and inventory to Petrolite Corp. in return for Petrolite capital stock. Wax operations of the two companies will be combined under the name of Bareco Wax Co., a division of Petrolite Corp.

TUSCOLA, Ill.—A new plant to produce 10,000,000 pounds per year of isosebacic acid will be built here by U. S. Industrial Chemicals Co., a division of National Distillers Products Corp. The operation will be based on butadiene, which will also be produced here by dehydrogenation of butane separated in the light hydrocarbons fractionation facilities of National Petro-Chemicals Corp.

The end product will be trade-named "U.S.I. Isosebacic" acid. It will consist of three isomers of sebacic comprising 72-80 per cent 2-ethyl suberic acid, 12-18 per cent 2,4-diethyl adipic acid, and 6-10 per cent sebacic acid proper.

DENVER. — A $7,000,000 natural gasoline plant near Sussex, Wyo., will be completed by Continental Oil Co. by January 1. The plant will be capable of processing 15,000,000 cu. ft. of gas daily, producing natural gasoline, butane, and propane. It will operate in conjunction with Conoco's $1,750,000 Sussex gasoline-recovery and gas-repressuring plant. It will process gas from the Sussex, West Sussex, and Meadow Creek fields.

Reaction faster, yield more from . . .

. . . Radioactive Processing

LINDEN, N. J.—The first specific evidence that atomic radiation can alter petroleum conversion reactions was revealed last week by Esso Research & Engineering Co.

Esso revealed its researchers have shown that radiation can:

. . . **Speed up catalytic** reactions in refining.

. . . **Increase yields** of gasoline from crude.

. . . **Make new additives** to improve crankcase lubricants.

. . . **Promote chemical reactions** unaided by catalysts.

Eger V. Murphree, Esso Research president, related the preliminary progress on this new dimension in petroleum refining during a company conference on radiation.

The radiation tests were made on both catalytic and thermal cracking. Radiation was supplied from Esso's high activity cobalt 60 source here and from other sources available at the Atomic Energy Commission's pile at Brookhaven National Laboratories, Long Island.

Speed up . . . The Linden experiments indicated that gamma radiation from cobalt 60 speeded up cracking reactions.

But more important, the researchers found that when the catalytic feed stock samples were exposed to atomic pile radiation gasoline yields were greater than those obtained under conventional conditions.

Esso stressed, however, that these are preliminary findings. Murphree stated that radiation thus far has indicated it will augment but not supplant the factors of heat, pressure, and catalysts in refining reactions.

Atomic polymer . . . Murphree explained other laboratory results from radiation. He said that when certain chemical materials are submitted to radiation they become additives which improve characteristics of crankcase lubricants. This improvement apparently extends to the viscosity index.

The company also demonstrated what can be done to promote chemical reactions. Liquid methyl methcraylate was exposed to gamma radiation, with no additional energy in the form of heat. The radiation initiated and carried through a polymerization reaction which converted the liquid to solid plastic.

Esso facilities . . . Esso's radiation source here is a length of cobalt pipe which was exposed to Brookhaven's atomic pile for 3 years.

On delivery to the Esso laboratory last summer, the cobalt had an activity of 3,500 curies. The rated activity now stands at about 3,100 curies. Its decrease is due to decay of the radioisotope.

Since the cobalt radioisotope gives off a type of radiation which does not make exposed equipment radioactive, it can be used in regular pilot plant experiments. Atomic pile exposure must be restricted to samples because neutron bombardment makes a stable isotope radioactive.

Rhode Island Plant Studied

RIVERTON, R. I.—Paragon Oil Corp. of Brooklyn is reported planning to build a 30,000-bbl. refinery here. Riverton is located on the Sakonnet River south of Fall River and across from the Commerce Oil Refining Co.'s proposed 30,000-bbl. refinery announced last spring.

Paragon was granted a certificate of rapid amortization in August 1952, for a 20,000-bbl. refinery to be located at Newark, N. J. These plans were later dropped. The company reportedly is considering the New England project instead.

Offshore Wildcat Dry

MIAMI. — Florida's first offshore test was abandoned last week as a dry hole after being drilled to a total depth of 12,631 ft.

It was Gulf Oil Corp.'s 1 State of Florida Lease 826-G Location is 7 miles off East Cape, in the open water of the Gulf of Mexico between the mainland of Monroe County and the Florida Keys.

Only minor oil shows were encountered. Prior to abandonment, a 13-hour drill-stem test was made, taking in the bottom 2,117 ft. of the hole. Only salt water was recovered.

Refinery Back on Stream

WILLISTON, N. D.—The Williston refinery of the Westland Oil Co. has gone on stream after being extensively overhauled by its new owners.

The plant is capable of running 1,200 bbl. of crude daily. It was originally owned by Williston Basin Refinery Corp., but was shut down by creditors and finally sold to Westland *(The Oil and Gas Journal, September 26, 1955, page 153).*

Mayors in Gas Tiff

Texans fighting to exempt industry from restriction

DALLAS.—Texas mayors are mustering forces to counter an expected attack by their big-city eastern counterparts on the Harris bill.

Mayors from all over the country are in Miami, Fla., for the annual American Mayors Association meeting November 27 through December 1.

The heads of local government in many big eastern cities have been campaigning vigorously against the bill to exempt independent gas producers from federal control.

They are expected to carry this fight into the annual meeting in an attempt to swing the association as a group against the bill.

M. D. Bryant, mayor of San Angelo and a past president of the Texas Independent Producers and Royalty Owners Association, urged in an open letter last week that Texas mayors prevent this from happening.

Specifically, Bryant appealed to Texas mayors to write Mayor Alex M Clark of Indianapolis to defend the bill and to attend the Miami meeting.

"The Harris bill, now before Congress, literally poses the issue of free competitive enterprise versus socialism," Bryant said. "Particularly in Texas is passage of this legislation important, for unless the independent gas producer is relieved of burdensome utility control, the Texas gas industry is doomed and a big step will have been taken toward the socialization of the entire fuels industry."

Texas Offers More Leases

AUSTIN.—The Texas School Land Board will open bids December 6 for oil and gas leases on 36,552 acres of school lands and 2,468 acres of game-preserve lands in Anderson County.

The school lands will include 1,239 acres of uplands, 810 acres of submerged lands off Jefferson County in the Gulf of Mexico, 26,733 acres of bays, and 7,769 acres of rivers and lakes.

Roughly 4,159 acres of leases will be offered in Caddo Lake, a big body of water straddling the Texas-Louisiana boundary. The lake was opened for leasing by a special act passed by the Texas legislature earlier this year. Substantial oil production already has been developed in the Louisiana portion of the lake.

Yemen Deal Signed

Former RFC chairman heads firm with contract covering 40,000-sq. mile area; exploration to begin early in '56

THE kingdom of Yemen has granted exploratory concession to a newly organized American company.

The contract covers the northern two-thirds of the little southern Arabian monarchy.

Exploratory work on the 40,000-sq. mile area will be started early in 1956, according to officials of Yemen Development Corp.

The agreement was revealed in Washington last week after weeks of negotiations between Yemen's royal family and the company. It has been ratified by Yemen's council of ministers and signed by Iman Ahmad, king of Yemen, and by Saif Al-Islambadr, Yemen's crown prince and deputy premier.

The German firm, C. Dielmann Bergbau, Gmbh., has been doing preliminary exploration work in Yemen for the past 2 years under a contract with the Yemen Government. Dielmann's original contract covered the entire country of Yemen, but geological and gravimetric work has been confined to the coast.

No conflict . . . Yemen Development Corp. officials said in Washington last week there is no conflict between its concession and the 1953 contract granted the German company.

Dielmann's contract expires in 1958 if no commercial production is found. It was not an exploration concession as such but a joint development deal. The Yemen Government contributed 75 per cent of exploratory costs and the German company the rest. Profits are to be split the same if commercial production is found in the coastal areas explored.

Yemen Development's concession calls for the customary 50-50 profit split if production is obtained. If there is no discovery within 6 years, the agreement can be voided. If oil is found, Yemen Development has a development concession for 30 years.

Chairman of the board of the company is George E. Allen. He is former chairman of the Reconstruction Finance Corp. and a personal friend of both President Eisenhower and former President Truman. Allen serves as a member of the boards of 31 corporations including Atlas Corp., Republic Steel Corp., Avco Manufacturing Co., and Occidental Life Insurance Co.

President of the company is Walter S. Gabler, foreign investment specialist in Washington. Gabler helped organize International Egyptian Oil Co., controlled by Swiss, Belgian, and Italian interests.

International Egyptian, with Southern California Petroleum Corp., as the operator, is now developing the Belayim and Fieran fields on Egypt's Sinai Peninsula, after buying the equipment of Standard Oil Co. of Egypt (Jersey Standard) when that company pulled out of Egypt in 1949.

Executive vice president of the new company is Jack Crichton, Dallas geologist. Secretary and general counsel is Jack M. Jessen, oil attorney.

Officials of the firm, accompanied by Fred Awalt, former State Department official acting as consultant, negotiated the agreement.

Yemen is located on the extreme southwest tip of the Arabian Peninsula. It has been largely closed to foreigners until the German contract was granted 2 years ago. An absolute monarchy, the country is almost entirely agricultural and has clung to the ancient Islamic traditions to the exclusion of any form of European culture.

The Yemen king announced after signing the new oil exploration agreement that he wanted to work closely with the American company to modernize and improve his country.

Pauley Project Approved

The Jordan parliament last week approved the exploratory agreement signed a month ago with Edwin Pauley, Los Angeles oil operator.

Pauley was granted a 55-year contract to explore for oil in the country. He has 8 months to select one-third of the country's 12,000,000-acre territory for an exploration and development concession.

Tail Gas to Warm Britons

Esso Petroleum Co. and England's Southern Gas Board have agreed "in principal" on a long-term contract to sell tail gas from the Fawley refinery as space-heating fuel for Portsmouth and Southampton.

Gas Board officials said recently tail gas from the 146,000-bbl. daily refinery could satisfy about 10 per cent of the board's commercial and domestic needs during a year.

The plan for using the tail gas, which is now flared, was disclosed after another English gas board said it would build Britain's first large-scale plant to produce oil from gas. British Petroleum Co.'s Kent refinery on the Isle of Grain will furnish the feedstock for the new 20,000-M.c.f. daily plant.

Libya Makes Deals

Jersey affiliate, French firm given concessions

THE first three concessions granted in Libya under that country's new oil law last week went to Esso Standard of Libya (Jersey Standard) and Cie. Francaise des Petroles.

Indications are that all concessions will be parceled out within the next 2 weeks.

Representatives of the dozen companies which filed more than 50 separate applications for acreage in Libya met 6 weeks ago in Tripoli to try and work out the conflicts. In some cases at least eight applications for acreage overlapped.

The Jersey Standard subsidiary was granted an area of about 20,000 sq. km. in southwest Fezzan along the Tunisian border. The concession was one of the easiest to work out in all that were filed in Libya. Only the Jersey Standard company and Libyan American Oil Co., a subsidiary of Texas Gulf Producing Co., applied for the acreage in Fezzan.

The French company received two concessions. One, 14,900 sq. km., is along the Tunisian border in the province of Tripolitania. The other, 6,214 sq. km., is at the bottom of the Gulf of Syrtes on Libya's Mediterranean coast in the province of Cyrenaica.

Under terms of Libya's new oil law, the competing companies were given a chance to work out conflicting applications among themselves before the government stepped in to settle disputes. Representatives of all the companies applying for acreage met October 3 and all reports indicate the conflicts have been adjusted.

The French company had no original application for acreage in Tripolitania, but industry sources said last week the concession was granted as a means of working out conflicts in other areas.

The new petroleum law fixes royalty to the government at 12½ per cent. A 50-50 profit split is required after production reaches 15,000 bbl.

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Egypt Dispute Over?

Settlement hinted, but firms not optimistic

THE long-standing dispute between Anglo-Egyptian Oilfields, Ltd. (Royal Dutch-Shell), Socony Mobil Oil Co., Inc., and the Egyptian Government finally may be nearing settlement.

The official government newspaper, Al Ghomhouria, reports from Cairo that Egypt's Government and the two companies have agreed and the cabinet is now considering the settlement. Company officials, however, are more cautious. They say there is agreement in principal, but that nothing has been signed.

The cautious attitude of the companies is well founded. The dispute, now 7 years old, was supposed to have been settled more than a year ago.

An Egyptian demand that the companies market products in Egypt at prices regarded as uneconomic has been the issue dividing the companies and the government since 1948. Neither company has engaged in any exploration work there since that date. Both have confined operations to producing existing fields—which have furnished all Egypt's domestic production.

The new agreement, declared the Government's newspaper, provides for equal distribution of profits, safeguards the country's interests, and will permit the companies to resume prospecting operations.

Royal Dutch-Shell and Socony Mobil have applications for 61 exploration licenses that were canceled arbitrarily by the Egyptian Government.

Terms of the new agreements are not known, but in July 1954 the government agreed tentatively to a new pricing schedule, to restore the canceled licenses, and to grant an exploitation lease for the Ras Matarma field discovered in 1948 by A.E.O.

Refinery Gases to Be Used

Refinery gases from Shell's 66,600-bbl. daily refinery at Shell Haven, Essex, will furnish the raw material for two new fertilizer plants to be built in England at a cost of more than $30 million.

Shell Chemical Co., Ltd., and Fisons, Ltd. signed an agreement to build the two plants last week. Shell Chemical will build an $18,200,000 plant at Shell Haven to convert refinery gases and other hydrocarbons to ammonia and nitric acid. The plan is expected to be turning out 75,000 tons of ammonia a year by 1958. Shell will use 15,000 tons to produce ammonium nitrate fertilizers.

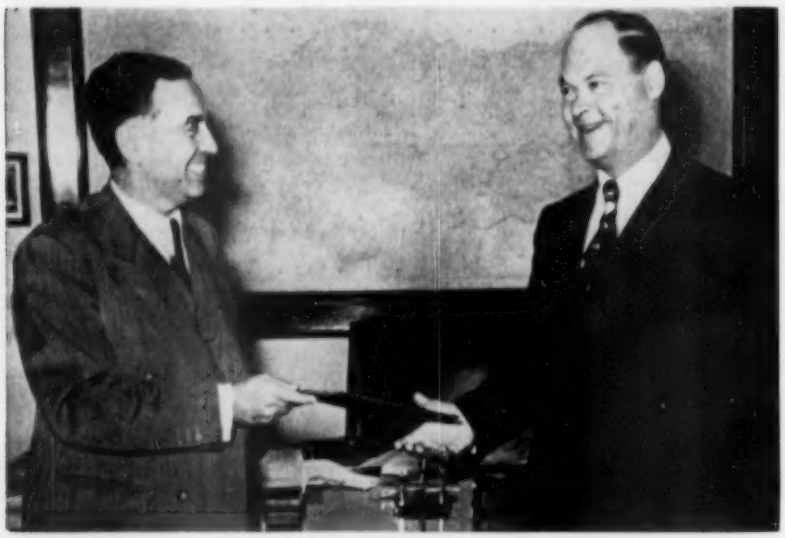
The Fisons plant, expected to cost $12,600,000, will take 60,000 tons of this ammonia a year for conversion into fertilizers.

Tanker Record Will Fall

The 47,750-ton tanker, Spyros Niarchos, the world's largest, will be launched December 2 at Barrow-in-Furness, England.

Built for the Stavros Niarchos shipping interests by the Vickers-Armstrong yards, the new supertanker takes the tonnage title from the 46,550-ton Al Malik Saud Al Awal, built for the A.S. Onassis interests. The world's third ranking tanker is the World Glory, built in the United States for the Niarchos interests.

Just how long Spyros Niarchos and a sister ship of the same size which is still under construction, can hold the title is a question. Tide Water Associated Oil Co. has four 50,000-ton tankers on order in French shipyards. The Kure, Japan, yards of National Bulk Carriers will start work next year on two vessels of more than 80,000 tons each.



Turkish Exploration Deal Signed

D. D. Feldman Oil & Gas has received a permit to explore three areas in Turkey. Emin Iplikci, left, president of the Turkish Petroleum Administration, and John H. Maxson, chief geologist for Feldman, recently signed the exploration permits. Feldman is one of three companies recently getting approval to explore in the country. The other companies are a Standard Oil Co. (N.J.) affiliate and Turkish Petroleum Co.

International Briefs

The Sidon, Lebanon, refinery of Mediterranean Refining Co. has increased its throughput from 6,250 to 9,000 bbl. daily and added a second 1,120-bbl. daily Platformer. Designed and licensed by U.O.P., the new unit is the third in operation in the Middle East.

British Petroleum Co., Ltd., will buy the 51 per cent interest which the New Zealand Government holds in British Petroleum Co. of New Zealand. Decision to sell the interest in the importing and marketing company was prompted by the need for licensed investment for expansion. The government decided to sell instead of adding to its investment.

The Gold Coast Government disclosed last week in Accra that it is negotiating with Gulf Oil Corp. for an exploration concession. Gulf organized a new subsidiary, Gold Coast Gulf Oil Co., several months ago, but said at that time it had not applied for a concession in the West African country.

Russia is reportedly offering "material and moral help" to Saudi Arabia in the boundary dispute with the British-protected sheikhdoms of the Arabian Peninsula. The offer was made at the Soviet embassy in Cairo last week after Saudi Arabia proposed that the United Nations supervise the Buraimi oasis until the dispute is settled. British-led Arab troops drove Saudi Arabian soldiers from the oasis in a skirmish over the potentially oil-bearing lands.

The refinery at Aden, operated by British Petroleum Co., Ltd., has processed 37,000,000 bbl. of crude since it went on stream in July 1954. October topped all previous records when the throughput of the refinery averaged 103,000 bbl. daily.

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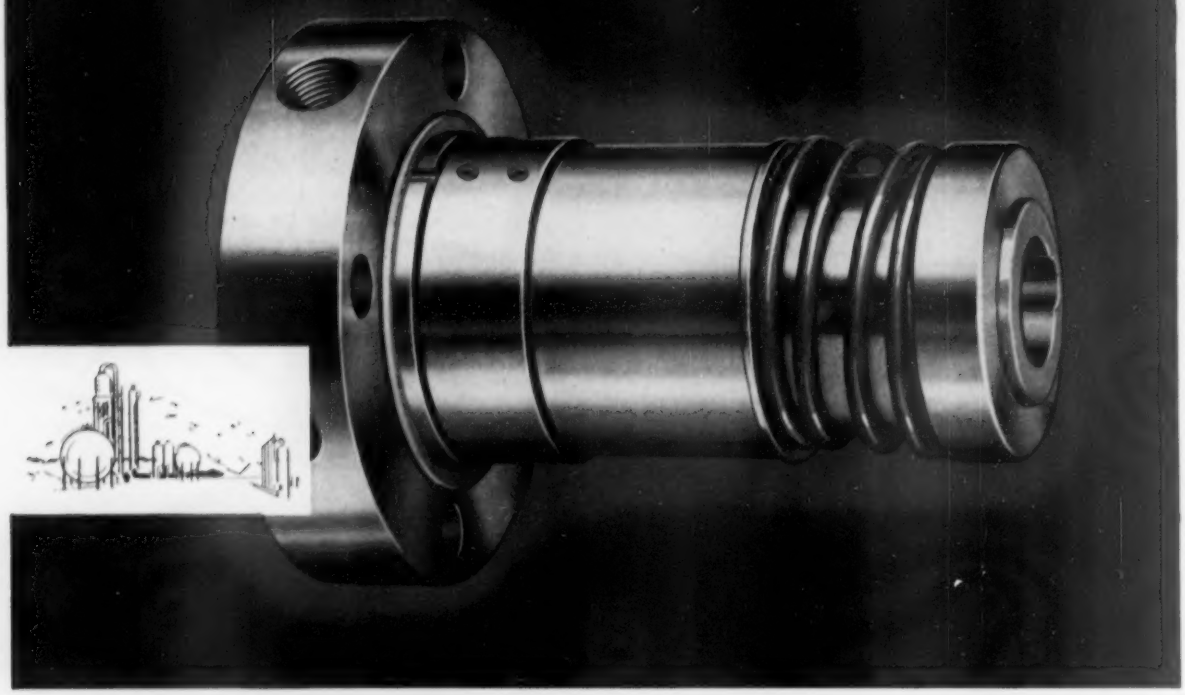

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World's Biggest Refinery Comes Back

- Abadan, rescued from Iranian nationalization, makes rapid recovery under international consortium guidance
- 148,000-bbl. daily average achieved during first year in drive to regain rated capacity of 500,000 bbl. daily

Paul Swain

This is a third in a series of articles outlining the operation of Iran's oil industry since it was taken over last year by the consortium. The two previous articles appear in the November 7 and 14 issues of the Journal.

WHEN the party of international oil experts surveyed Iran's oil fields and its Abadan refinery before the consortium agreement was finally signed, they found the mammoth refinery in surprisingly good condition.

The 500,000-bbl. daily refinery, conceded to be the world's largest, had been idle for 3 years, but it had routine maintenance during those idle years. Iranian Oil Participants, Ltd., paid tribute to the Iranian engineers who maintained the refinery's units when it made its first annual report, recently.

Before the refinery could go back into operation, however, I. O. P. pointed out, every unit in the huge plant had to be inspected and cleaned, defective parts replaced, instruments checked and everything tested. Plans also had to be made to keep the aging portions of the refinery abreast of modern refining developments.

The job is taking about 4,500 workers under the direction of 441 engineers. All but 41 of the engineers are Iranians. It's a job that is by no means complete. It won't even be finished in another 2 years.

What has been done . . . Maintenance crews of Iranian Oil Refining Co. completed 11 routine and 50 major overhaul jobs on units of the Abadan refinery in the year that followed the consortium agreement. These included five distillation units, 10 washing units, two sulfur dioxide extraction units, one sulfur dioxide production unit, nine cracking units—including the 35,000-bbl. daily fluid cat cracker—four gas fractionators, three alkylation units, one reformer, and three units of the lube-oil plant.

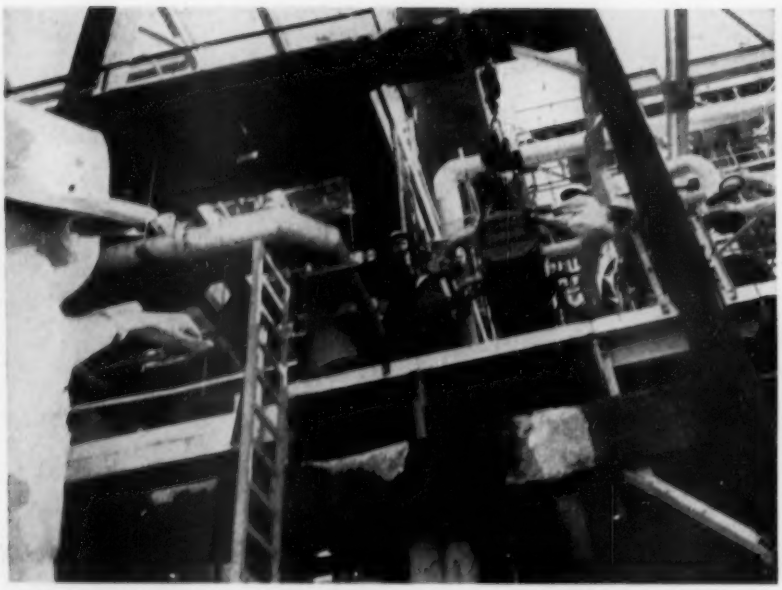
It took 55 working days with an average of 165 men on the job daily to

Abadan Refinery Output

(Barrels daily)

	Crude processed at Abadan	Products taken by N.I.O.C.	Tankers loaded at Abadan (products)
November 1954	102,000	30,400	18
December 1954	118,000	26,300	26
January 1955	148,000	31,500	36
February	163,000	32,300	28
March	165,000	33,800	31
April	152,000	33,500	36
May	154,000	31,100	36
June	156,000	30,500	24
July	148,000	30,400	27
August	155,000	28,000	31
September*	164,000	31,400	30
October*	158,000	30,400	30
Average	148,000	30,800	Total 353

*Partly estimated.



ABADAN'S 35,000-BBL. CAT CRACKER needed a general overhaul before going back on stream. The job was finished last month on the anniversary of the signing of the consortium agreement.

PAUL KUHL, general manager at Abadan, is a Jersey Standard veteran with experience in the U. S. and Caribbean.

put one of the large distillation units back on stream. The big cat cracker, which went on stream only a short time before nationalization took the refinery out of the hands of Anglo-Iranian (now British Petroleum), required 80 working days of 300 men to put back in shape to operate. The cracker went back on stream just a year after the agreement was signed.

The remaining units . . . Twenty-eight more individual overhaul jobs will be completed by the end of 1955 and 78 more are planned for next year. By the end of 1956, more than 150 separate units of the refinery, each of varying importance to the over-all operation, will have been renovated. They represent about 80 per cent of the refinery's total equipment.

Work on the Alkylation unit is now going on. It will require the work of from 300 to 325 men working 85 days to complete.

Daily average throughput of the refinery is about 148,000 bbl. This is expected to be increased to about 220,000 bbl. daily in the spring of next year, and to 280,000 bbl. daily by the end of 1956.

One distillation unit was on stream when the agreement was signed. Three more distillation units were the first to be put on stream as the work began. The refinery is now geared to produce a maximum yield of middle distillates along with its output of gasoline and fuel oil.

As the distillation units were put back on stream, gas fractionators, reformers, and other auxiliary units were added to keep pace with the increased throughput schedule. One small alkylation unit was started in August. The others went on stream at about the same time the big cat cracker was put back into operation last month.

Abadan's background . . . The refinery is located on the Shatt-al-Arab River about 40 miles from the head of the Persian Gulf. It is by no means a new installation. The first refining units at Abadan went on stream in 1912. By 1918, the refinery throughput was about 18,000 bbl. daily, and by 1949 its output was 428,000 bbl. daily.

With the virtual shutdown of the refinery in 1951, the British left 13,000,000 bbl. of products in storage at Abadan. Efforts of National Iranian Oil Co. to export this were largely a failure. Most of it went to serve the country's internal demand of some 15,000 to 20,000 bbl. daily.

One of the last installations built at Abadan before the nationalization was the lube-oil plant with a capacity of 20,000 tons a year. The Iranians operated the plant at a reduced output throughout the disputed nationalization period in order to meet the country's domestic needs for lubricants. The plant is now on stream under the consortium operating company's management.

The Masjid-i-Sulaiman topping plant was put back into operation in September and is processing about 20,000 bbl. daily to produce fuel oil for Iran's internal market.

Administration . . . As in the case of the exploration and production company in Iran, the refining operating company makes use of Iranians on the administrative level. Three of the four members of the coordinating group which reports directly to the general refinery manager are Iranians. Five of the 12 refinery departmental managers are Iranians.

Four Rigs Headed for Israel

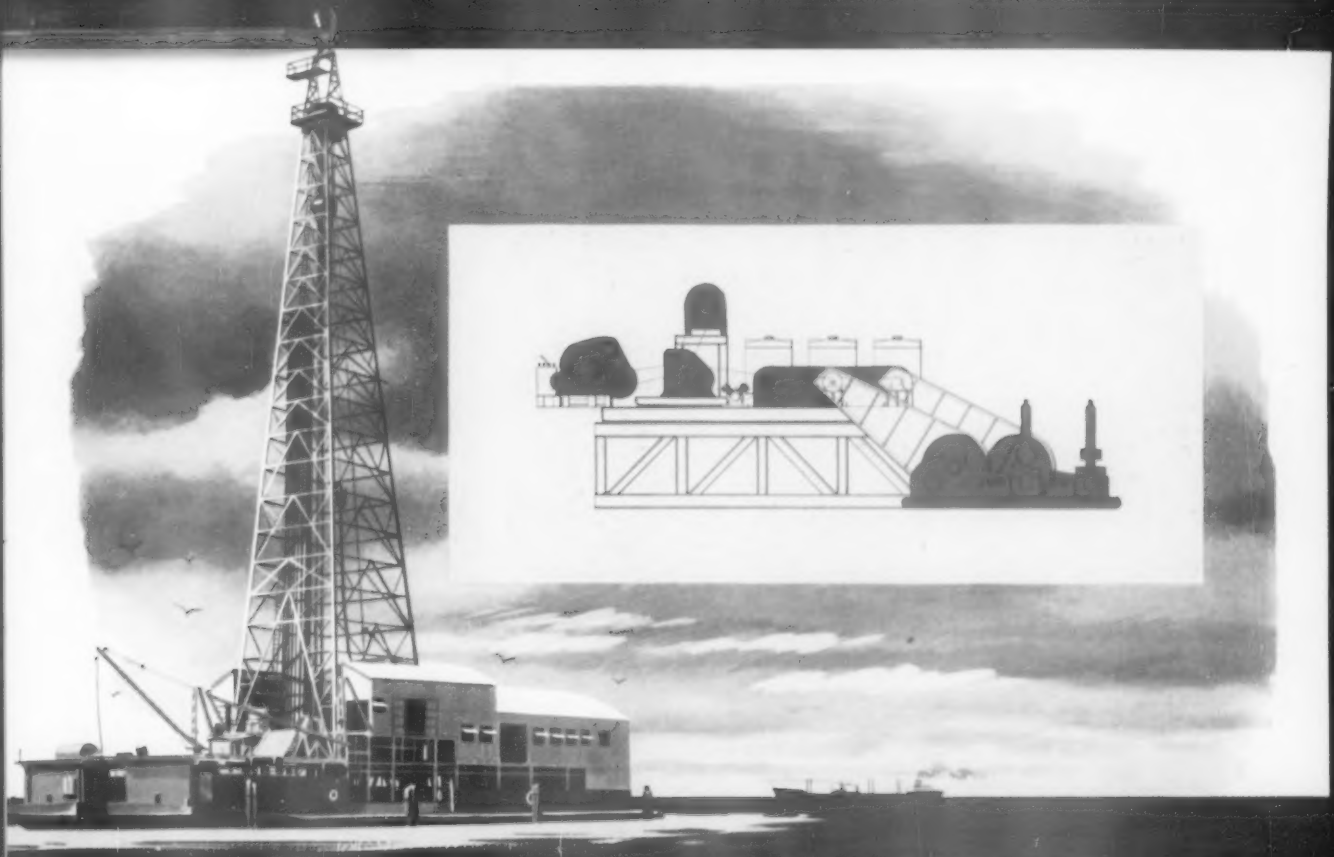
Four new rigs are going to Israel to take part in a drilling boom that is almost certain to follow the recent discovery of oil in the Mediterranean country.

Two of the rigs have been purchased by Israel Water Works, Ltd., and the other two for Matzada Co. Matzada is a drilling company set up by Lapidoth Israel Petroleum Co., Ltd., and Israel Oil Prospectors, Ltd. The two companies brought in Israel's first discovery in September *(The Oil and Gas Journal, October 3, page 96)*.

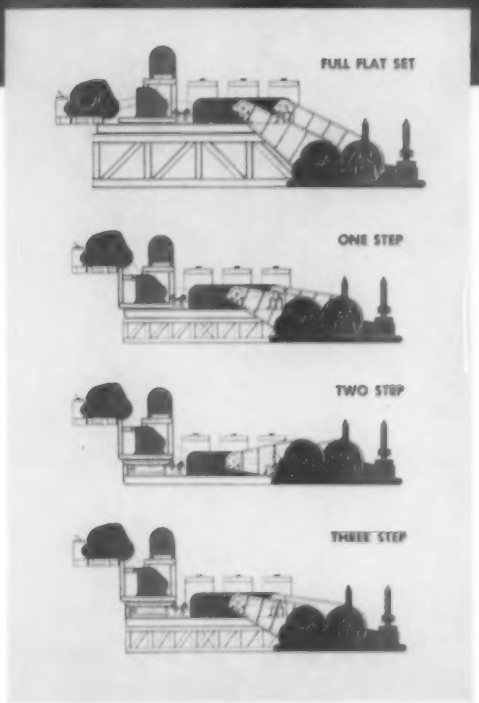
Each company will get an Ideco H-525 and an Ideco H-750. The H-525 is rated at 7,000 ft. and the H-750 at 9,000 ft. They will be delivered within the next 3 months.

The new rigs will bring to nine the number of rigs in Israel. It also is reported Tri-Continent Drilling Co. has purchased a second-hand rig that will go to Israel.

The increased drilling is mandatory in Israel. The country's oil law says drilling must start within 6 months on any license within the district in which a discovery is made. There are 13 licenses or concessions in District 2, where the Lapidoth-Israeli strike was made.



PACKAGE DESIGN PAYS-OFF OFFSHORE



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AND THEN THERE WERE FOUR . . .

Fluid Coke—New Fuel for Steam Industry

by F. H. Stracke* and F. H. Schiffer†

LABORATORY and full-scale tests show that the steam industry now has a fourth fuel, fluid coke, which can compete with coal, gas, and oil.

This article covers the program undertaken by Esso Research & Engineering Co. to determine the adaptability of this product to steam raising, including the full-scale combustion tests which have recently been completed at the Essex station of Public Service Electric & Gas Co.

Approximately 5 years ago, Esso Research & Engineering Co. embarked on an extensive program to develop a new process which would upgrade heavy fuel oil to lighter products. The end result of this program was the present processing unit referred to as the fluid coker. In recent months many articles have appeared dealing with this new process.[1 2 3] Most of these articles have dealt with process details of the unit itself while only briefly covering the characteristic and possibilities of the solid product which has been called fluid coke.[4 7]

The many possibilities associated with fluid coke came to the attention of Esso Engineering approximately 2 years ago when its scientists became active in a project to determine ways and means that this new product could best be used. Realizing that if the fluid coking process were to go ahead to completion, the refiner would be faced with the problem of moving large volumes of a carbonaceous material new to the industry, a long-term development program was established.

It was apparent from early paper studies that the material would be useful as a fuel and primarily for steam raising. It therefore became necessary to organize a program to find out how this material could best be used for fuel purposes. At that time the world's total supply of fluid coke, which incidentally was the result of pilot-plant operations, consisted of about 10 tons of the material. It was obvious that the usual volume-burning "cut and try" technique so familiar to the fuel industry would not apply in this special instance. Therefore a second problem became apparent. That was the development of this material as a fuel while having little of it to work with.

Four-point program . . . To cope with this situation, a four-part program was established. First, the likelihood that this material could be used as a fuel at all was investigated by means of theoretical combustion calculations. In this phase of the project, the work of Professor Hottell and his associates, Stewart of M.I.T., were invaluable.[5] Using their techniques, equations, and personal advice, it was concluded that here was a material that could be used in large boiler furnaces as a pulverized fuel provided the furnaces were operated in a manner somewhat similar to that required for anthracite coal.

At first this appeared discouraging for it was realized that the volume of anthracite coal burned today in large steam-raising equipment is relatively small. There was, however, sufficient evidence to indicate that this material could be burned in furnaces normally using pulverized bituminous coal.

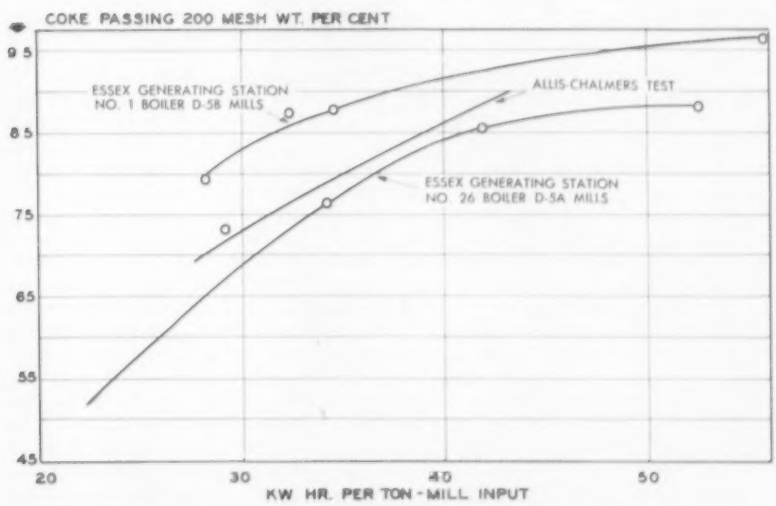
The second part of the four-part program was to set up a laboratory-scale series of tests. The work of Sherman at Battelle Memorial Institute recommended itself as a means of testing while consuming only small quantities of fuel. Actually, only a little more than 4 tons of coke were finally used during these tests.

The third part of the program was to run pilot-plant-scale tests should the laboratory tests bear out the theoretical calculations. More samples would then be available from the coker-pilot-plant operations. The fourth and last part of the program was to operate full-scale tests at such time as sufficient coke could be made available.

It was known at the start of this program that approximately by January 1955, the first of the fluid-coking units would be in full-scale operation at the Billings, Mont., refinery of Carter Oil Co. By this time it was planned to have the laboratory and pilot-plant operations well under way in order to permit full-scale testing with a minimum loss of time.

The time scale on this program has been such that the first of the full-scale tests have been recently completed and it can now be said without reservation that this material is completely usable as a fuel in modern furnace installations. About 1,000 tons of fluid coke have been successfully burned under the boilers of Public Service Electric & Gas Co.

Test work . . . Table 1 illustrates a few of the physical properties of the material from the pilot-plant operation. Column 4 of this table illustrates the physical properties of the material presently being obtained from full-scale operations. It can be seen that fluid coke is low in hydrogen content as compared



POWER REQUIREMENTS for Foster Wheeler ba'l mills when grinding fluid coke to required degree of fineness for proper burning. Fig. 1.

*Esso Research & Engineering Co., and †Public Service Electric & Gas Co. of Newark, N. J.

to a high or a low-volatile coal. The carbon content is approximately 84.8 per cent which is comparable with both high and low-volatile coals.

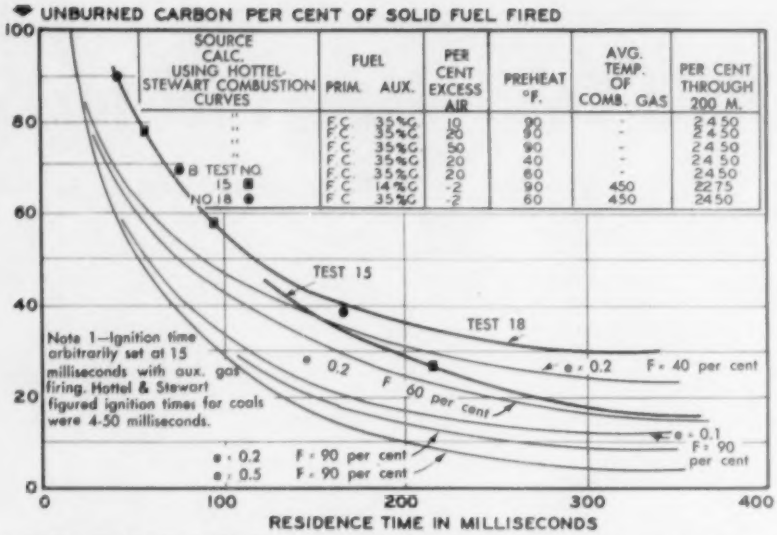
In this particular sample, the sulfur is running approximately 7.7 per cent as compared to 0.6 and 0.7 for the two comparative coals. It does not necessarily follow that the sulfur content of all fluid coke will be as high as the values tabulated here. The coke represented by this sample was formed from a high-sulfur-bearing crude. Should coke be formed from sweet crudes, the sulfur content would be lower. In actual field operations at the Billings unit the sulfur content is running approximately 5.2 per cent.

Table I also shows the size analysis of the material representing that produced by the pilot-plant unit. From this, it can be seen that the great bulk of the material was in the range of about 30 to 100 mesh. Theoretical calculations indicated the material would probably have to be pulverized to serve as a valuable fuel. Therefore, a third problem was apparent. That was, how and what type of equipment could be used for grinding of fluid coke, and how could it be ground.

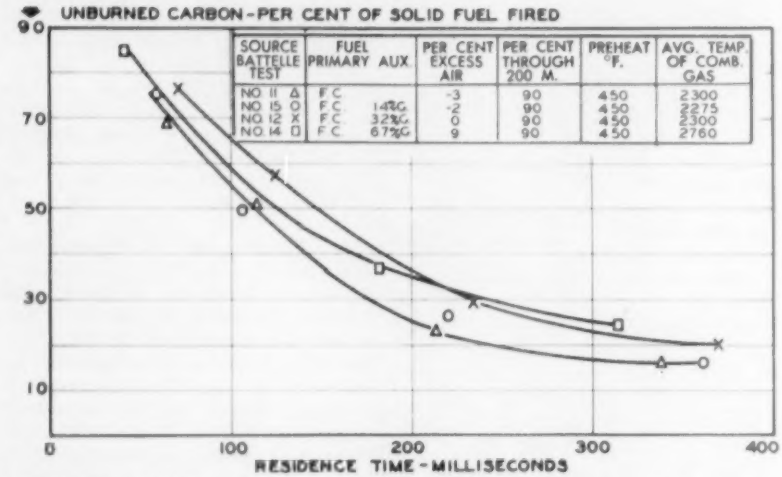
To avoid any loss of time, a program to determine the grinding characteristics of this material coincided very closely with the combustion work. The product from the grinding tests could possibly be allocated for use in burning tests. However, as it finally worked out, the Battelle laboratories were equipped with suitable tools to not only burn but also grind the material to the fineness required.

Grinding tests . . . The bulk of grinding work was conducted at the research laboratories of Allis Chalmers Manufacturing Co. in Milwaukee, using both conventional rotating-ball mills as well as its new development, the vibrating-ball mill. Several samples were ground to varying finenesses. It was possible to construct theoretical curves indicating the kilowatt-hours required to grind coke to various finenesses.[6] Such a curve is shown as the middle line in Fig. 1.

While the work at the research laboratories of Allis Chalmers represented the major effort made by Esso Research & Engineering in the field of grinding, other manufacturers of grinding equipment had independently run their own test work. All of these tests indicated that the power required to grind fluid coke would be roughly 2 to 2½ times that required to grind a standard 55 Hardgrove coal to the same fineness. It might be well to point out at this time that actual field tests have borne out these results remarkably well.


UNBURNED CARBON PER CENT OF SOLID FUEL FIRED
SOURCE CALC. USING HOTTEL-STEWART COMBUSTION CURVES
FUEL PRIM. AUX.
PER CENT EXCESS AIR
PREHEAT °F.
AVG. TEMP. OF COMB. GAS
PER CENT THROUGH 200 M.
B TEST NO. 15
NO 18
TEST 15
TEST 18
Note 1—Ignition time arbitrarily set at 15 milliseconds with aux. gas firing. Hottel & Stewart figured ignition times for coals were 4-50 milliseconds.
e = 0.2 F = 40 per cent
e = 0.2 F = 60 per cent
e = 0.1 F = 90 per cent
e = 0.2 F = 90 per cent
e = 0.5 F = 90 per cent
RESIDENCE TIME IN MILLISECONDS

THEORETICAL UNBURNED CARBON as a function of residence time for various amounts of excess air and finenesses of grind. Fig. 2.


UNBURNED CARBON-PER CENT OF SOLID FUEL FIRED
SOURCE BATTELLE TEST
FUEL PRIMARY AUX.
PER CENT EXCESS AIR
PER CENT THROUGH 200 M.
PREHEAT °F.
AVG. TEMP. OF COMB. GAS
NO. 11 Δ F C -3 90 450 2300
NO. 15 O F C 14%G -2 90 450 2275
NO. 12 X F C 32%G 0 90 450 2300
NO. 14 □ F C 67%G 9 90 450 2760
RESIDENCE TIME-MILLISECONDS

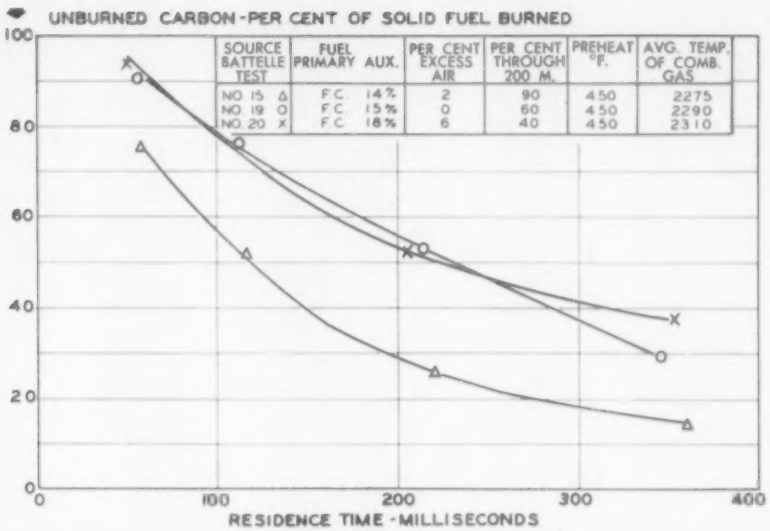
UNBURNED CARBON as a function of residence time for varying amounts of auxiliary fuel. Fig. 3.

Based on the theoretical combustion calculations, a series of 18 tests were set up to be conducted at the Battelle laboratories. These tests were based on varying the fineness of grind, per cent auxiliary fuel, and per cent excess air used in burning coke. The techniques developed by Sherman and covered by numerous technical articles published by him were used in the early stages of the investigations into the burning characteristics of fluidized coke.

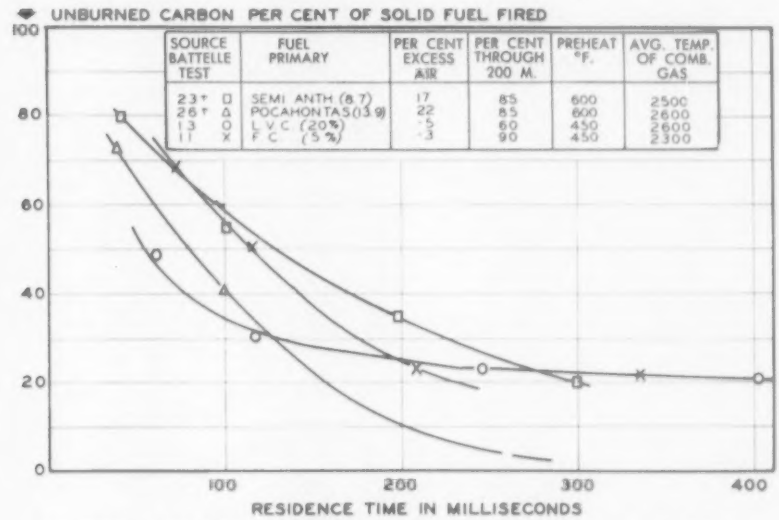
The theoretical effects of fineness of grind and excess air on the burning rates of fluid coke are shown in Fig. 2. Sherman's application of his work to earlier test data on coal firing in a similar type of furnace were used to prorate, on the basis of physical characteristics of the coals and fluid coke, the performance of coke under similar combustion conditions. Again at this point it is well to point out that these original predictions were met very closely in our laboratory work. Two actual test burnings are plotted for comparison on this curve.

At first glance, these indicate the predictions to be somewhat optimistic. However, after adjusting for differences in excess air, ignition time, and combustion temperature between the test data and the predictions, test results correlate fairly well.

For example, reducing the unburned of test No. 15 to allow for an increase in excess air from —2 per cent to +10 per cent alone brings these data into line fairly well with predictions. The time for ignition after coke has entered the furnace would appear to be about the same as the assumed ignition time



UNBURNED CARBON as a function of residence time for various degrees of fineness of grind. Fig. 4.



UNBURNED CARBON as a function of residence time for various fuels. Fig. 5.

of 15 milliseconds as evidenced by the projection of the curve to 100 per cent unburned point.

The curve of test No. 18 indicates that the ignition time was somewhat longer. This is reasonable as the coarser coke, 60 per cent through 200 mesh, would take longer to heat to its ignition temperature. The theoretical curves will displace to the right for greater ignition time. No attempt was made to reflect the ignition-time difference in the predictions for various finenesses of coke.

Carbon balance . . . The data used in compiling all test results were calculated by the carbon-balance method. In most instances the dust-sampling method gave considerably lower unburned carbon values. If the dust-sampling technique was reasonably accurate, a combustion-air metering inaccuracy or an Orsat sampling leakage could account for the discrepancy.

The effect of auxiliary fuel on unburned carbon is shown in Fig. 3. In this case, the auxiliary fuel was gas and the increase in unburned carbon can be explained by the fact that gas utilizes its theoretical air almost immediately resulting in most of the coke burning being carried on in an atmosphere of lower oxygen partial pressure than when less auxiliary gas is used at the same total excess air. The unburned carbon for test No. 14 would be even greater relative to the other tests if its combustion temperature and excess air were in line with the rest of the tests. As fuel oil and coal burn at lower rates, this effect is known to be much less when utilizing them as auxiliary fuel. Even though the unburned coke increases with a greater percentage of auxiliary gas, the unburned in terms of total fuel fired tends to cancel the effect mitigating this factor from a pollution point of view.

The effect of fineness of grind of the coke on unburned carbon is shown in Fig. 4. Size distribution of coke fired for the 40 and 60 per cent through 200-mesh tests could possibly account for the crossing of the burning curves in the earlier stages of combustion.

Fig. 5 is a plot of the burning rates of two coals tested by Battelle for another project, a low-volatile-coal control test and a 100 per cent fluid-coke test. In general, the data indicate that the 90 per cent fine coke burns considerably better than the semianthracite at 85 per cent fineness when taking into account excess air but not quite as well as a low-volatile bituminous coal. It was based on this and other similar tests that it was decided that conventional anthracite furnaces were not required for the burning of fluid coke.

It should be pointed out that the unburned carbon levels in all the above curves are higher than those that would normally be expected in a full-scale furnace because of the shorter combustion time in the test furnace used. The full-scale tests have borne out the fact that carbon losses are not as great as those shown in these curves.

Full-Scale Tests

With the program at Battelle near completion and the start of the first fluid unit nearly a reality, it became desirable to plan full-scale tests. Arrangements were made with Public Service Electric & Gas Co. to conduct these tests at its Essex generating station.

By early March 1955, 500 tons of coke, transported in hopper-bottom cement cars, were received at the Essex generating station. The coke was unloaded and transported to bunkers through the existing coal belt-conveyor equipment which has inclines as high as 20°.

No serious difficulties were encountered. However, for coke operation the conveyor capacity is reduced to about one-half. For continuous operation dusting may be a problem at transfer points.

Because the effect of the new fuel on an actual boiler was unknown, a Babcock & Wilcox 605,000-lb. per hour 1,475-psig. 950-F radiant-type unit was chosen for the first tests. This boiler, No. 26, was installed in 1938. Over-all heat-release rate is 27,000 B.t.u. per hour per cubic foot. The boiler is

TABLE 1

	Coal high volatile	Coal low volatile	Coke pilot plant	Coke full-scale unit*
Ultimate analysis:				
Carbon	75.4	83.5	84.8	87.30
Hydrogen	5.0	4.6	1.7	2.42
Sulfur	0.6	0.7	7.7	5.17
Oxygen	7.8	4.3	4.2	3.25
Ash	10.1	5.9	0.8	0.30
Nitrogen	1.1	1.0	0.8	1.57
B.t.u. per lb.				14,125
Specific gravity				1.4
Size analysis:				
Retained on 16 mesh			3.25	5.42
Retained on 30 mesh			8.92	1.81
Retained on 50 mesh			58.08	18.77
Retained on 100 mesh			28.28	43.80
Retained on 200 mesh			0.74	25.06
Passed 200 mesh			0.73	5.14
Ash fusion temperature:				
Reducing atmosphere, I.D.				2,870
St.				2,900+
Ft.				2,900+
Oxidizing atmosphere, I.D.				2,450
St.				2,530
Ft.				2,580

*Data supplied by Babcock & Wilcox Co.

TABLE 2—ANALYSIS OF COKE

Proximate analysis (as received)	Pulverized coke	Coke refuse
Moisture, per cent	0.30	
Volatile matter, per cent	6.75	2.00
Ash, per cent	0.30	2.55
Fixed carbon, per cent	92.65	95.45
Sulfur, per cent	5.15	4.67
B.t.u.	14,111	13,265
Reactivity T(15° C.), °C.	348	411
Specific gravity	1.4	1.582

Above data supplied by Foster Wheeler Corp.

equipped with air heaters, economizer, and electrostatic precipitators.

Fuel pulverized . . . Pulverized fuel is supplied by two Foster Wheeler Type D-5A ball mills, each feeding three B.&W. multiple-finger intertube burners which downfire into the primary furnace. Before start of the tests this boiler had been oil-fired for a number of years. Early test runs were made on this unit to check the ability of the auxiliary equipment, feeders, and ball mills, to handle fluid coke and to acquaint operating personnel with solid-fuel firing. A minor adjustment was made to the feeders to enable them to handle fluid coke.

Mills supplying this boiler were rated at 16 tons per hour when handling 91-Hardgrove 5 per cent moisture coal and grinding it to 82 per cent through 200 mesh. At the same fineness, mill capacity was about 6 tons per hour when handling coke. This compared favorably with the original derating estimate of 2.5. Lower curve, Fig. 1, shows results of tests on these mills.

Reduced load tests on this boiler were made with coke providing 52 to 64 per cent of the total heat supplied. Mills produced a coke of 46 to 90 per cent through 200 mesh. Full-load runs were made with coke supplying 17 to 52 per cent of the total heat supplied, with about same range of fineness.

At higher coke loadings, fineness from mill decreased and unburned coke to the precipitator increased. While unburned coke to the precipitators was high, it was not felt to be excessive. Based on the recativity of the precipitator samples collected it is believed the material could be reinjected and successfully burned.

Efficiencies . . . At full load, boiler efficiency during the tests ranged from a low of 78.8 per cent when coke supplied about 37 per cent of the heat to a high of 86.4 per cent when coke supplied about 17 per cent of the total heat. With an increase in coke fineness, losses to the precipitators decreased.

Based on the per cent of total fuel fired, unburned coke to the precipitators ranged from a low of 2 per cent with a coke fineness of 88.0 per cent through 200 mesh to a high of about 10 per cent when firing coke of 51 per cent through 200 mesh.

Second test . . . After burning about 500 tons of coke without noticing any detrimental effects on No. 26 boiler it was believed desirable to test a newer and larger boiler, No. 1 boiler, installed in 1947. This boiler is a B.&W. 900,000-lb. per hour radiant-type unit rated 1,500 psig. and 1,000° F. at the superheater outlet.

Over-all heat-release rate is about 22,000 B.t.u. per hour per cubic foot. Boiler is equipped with air heaters, economizer, attemporator, and electrostatic precipitators. Pulverizer fuel is supplied by three Foster Wheeler Type D-5B ball mills, each feeding four B.&W. circular burners equipped for coal, oil, or gas firing.

Combustion in this unit appeared much better than in the No. 26 boiler. Fig. 1 shows comparative grinding tests. Full-load boiler efficiencies ranged from a low of 87 per cent when coke supplied 17 per cent of the total heat to a high of 88 per cent when coke supplied 45 per cent of the total heat. Precipitator losses were considerably less than the No. 26 boiler.

Circular burners . . . The circular burners of No. 1 boiler appeared to be better suited to coke burning than the intertube burners of No. 26 boiler. Moreover the absence of a slag screen in No. 1 boiler seems to have contributed to the better combustion conditions experienced in No. 1 boiler.

It appears that the per cent of volatile matter in the coke burned on No. 1 boiler was in general higher than that burned on No. 26 boiler. The volatile matter ranged from 6 to 8 per cent for the No. 26 boiler tests whereas it ranged from 7 to 14 per cent for No. 1 boiler tests.

In all tests at this station it was necessary to maintain an auxiliary fuel flame at each coke burner to insure proper combustion.

These tests showed that electrostatic precipitators will function properly when handling fluid coke. Other large-scale tests indicated mechanical precipitators are somewhat more efficient handling fluid coke refuse than when handling fly ash.

Public Service has contracted for the entire output—about 170 tons per day—from the fluid coking unit recently completed at Esso Standard Oil Co.'s Baltimore refinery.

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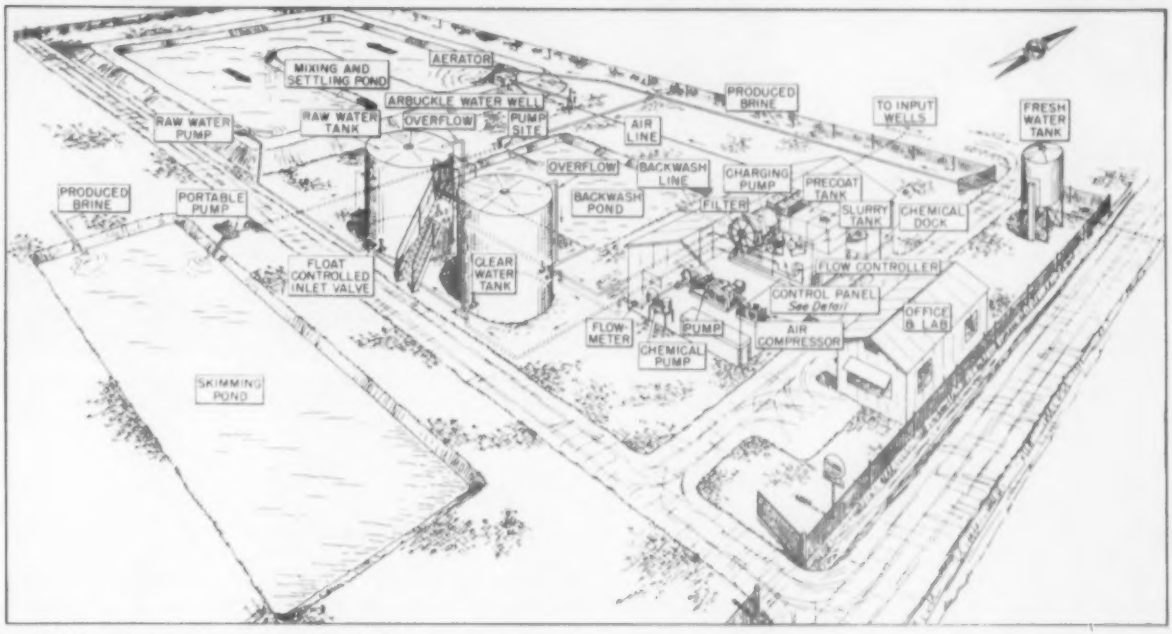


SIGNAL'S pilot plant, sketched here, is designed for small test water floods. Units are skid-mounted so that the entire plant can be moved to a new location after tests are completed.

1. Signal Uses "Package" Pilot Plant

by J. L. Eakin

SIGNAL OIL & GAS CO. conducts pilot water-flood operations with a "package" plant designed for portability. All of the controls for this project are centrally located. Diatomaceous-earth filters and the chemical treating system are skid-mounted for easy moving to new test locations.

Flooding of the 35 acres of Bartlesville sand under test results from brine injection into 6 wells. Brine comes from a water well producing from the Arbuckle limestone.

Injection water lift . . . At present, compressed air piped to the bottom of the water well lifts the brine. The air-water mixture flows up the annulus between 2⅜-in. fibercast glass tubing string and the 1-in. air line. Aeration of the water which occurs serves as a primary treating method to remove dissolved hydrogen sulfide.

About 1,300 bbl. of brine passes through the treating plant daily. To boost the water supply, the air-lift method is to be replaced with a turbine pump. Aeration of the water will then be carried out in a tower packed with raschig rings.

The above drawing of plant shows the water-treating sequence. Secondary aeration of the water from the supply and producing wells occurs as the water passes into the 1,700-bbl. settling pond. A sump pump draws the water from the pond and keeps the 500-bbl. raw-water tank filled.

Diatomaceous earth filter . . . Raw water flows from the tank to a pump which forces it through a 150-sq.-ft. filter. Before the water reaches the filter, another pump injects a diatomaceous-earth slurry into it. This material forms a cake on the filter through which the water passes. Periodically the filter screens are rotated past jets of clear water to remove accumulated filter cake.

Precoat material, a mixture of asbestos and diatomaceous earth, is mixed in a glass-fiber precoat tank located alongside of the slurry tank. During filtering, precoat material is drawn from the mixing tank by the slurry pump. This pump also continuously draws additional diatomaceous-earth slurry and a corrosion inhibitor from the slurry tank.

The diatomaceous-earth filter is highly efficient in removing suspended matter in the water. It even removes most of the sulfate-reducing bacteria.

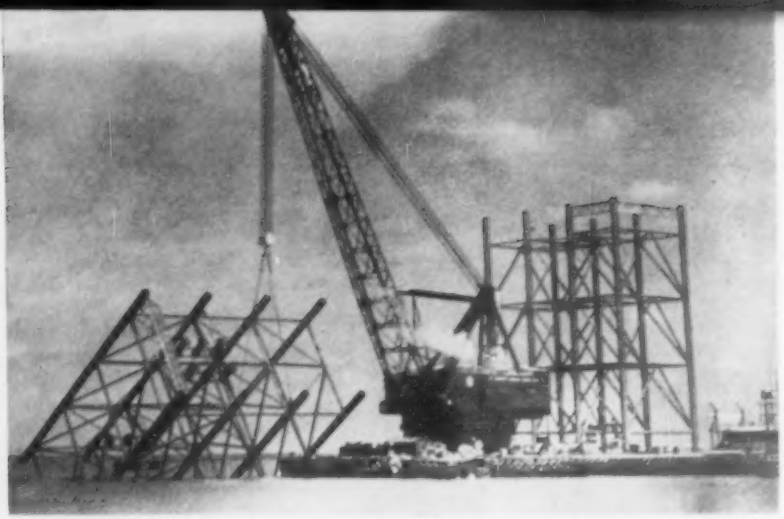
Injection of water . . . Clear water from the filter goes to a tank before being injected into the wells. As the water is drawn out of the tank, a chemical feed pump injects corrosion inhibitors and bactericides.

The 2¼ by 3-in. triplex injection pump has ceramic plungers and is driven by a 15-hp. variable-speed electric motor. The variable-speed drive has proved convenient during the pilot operations as optimum operating procedures have not been stabilized.

Water tests . . . Another outstanding feature of the plant is the well-equipped water-analysis laboratory in the field office. Routine tests made on the injection water include determination of iron, sulfides, pH and plugging tendency. A spectronic colorimeter is used for analysis of various brine constituents.

Author is petroleum engineer, U. S. Bureau of Mines, Bartlesville, Okla. Material is from USBM R. I. 5134.

Here's How That Phillips Offshore Rig Was Erected



1 **A 250-ton revolving crane on the construction barge upends one of the two big templates to set it on bottom. The template, or jacket, previously had been laid on its side in shallow water preparatory to being moved to drilling location.**

BUILDING platforms for offshore drilling are becoming a routine job at shipyards along the Gulf Coast. But erecting the massive structures in the sometimes-turbulent Gulf of Mexico calls for some extraordinary skill and coordination.

This picture series is a step-by-step record of one of the toughest jobs of this kind yet accomplished—erecting a big self-contained platform 40 miles from shore and in water 85 ft. deep. Phillips Petroleum Co. is drilling from the man-made island in Block 184, Eugene Island area, off St. Mary Parish, Louisiana.

The platform was moved to the drilling site and erected by J. Ray McDermott & Co., Inc.

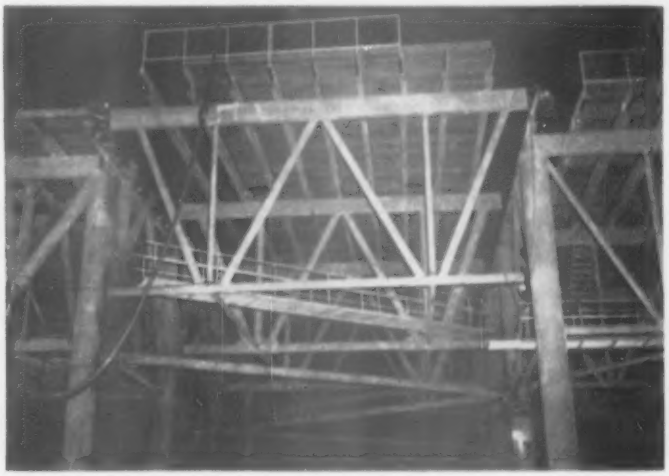
(Following is an article describing operation from this platform.)

4 **After the pipes are all driven, the giant crane operating from the 90 by 300-ft. construction barge lowers the two end deck sections onto the substructure. Note how the legs of the deck section have been sharpened to fit into the pipes.**

2 Jacket is in place at well site, ready to receive pipes which will anchor it to the gulf floor and support the platform deck. Note saucer-shaped conductor guides through which casing will be planted.

3 Next, 30-in. pipes, 242 ft. long, are lowered into template and hammered by pile driver to desired depth.

5 Legs of deck sections are welded to lower pipes. Pipes are welded to jacket.



6 Here the center deck section is being moved into place for welding. Decks are preformed before going to location.

7 Now the crane picks up dormitory building which will be set above mud and water tanks at upper deck level. Platform on top is helicopter landing deck.

8 Here's the finished product with derrick raised. It's 140 by 85 ft.

PLATFORM ON LOCATION off Eugene Island has a diesel-electric rig; six wells can be drilled from the location. Fig. 1.

DIESEL-ELECTRIC rig is used to reduce the weight carried by the substructure. Fig. 2.

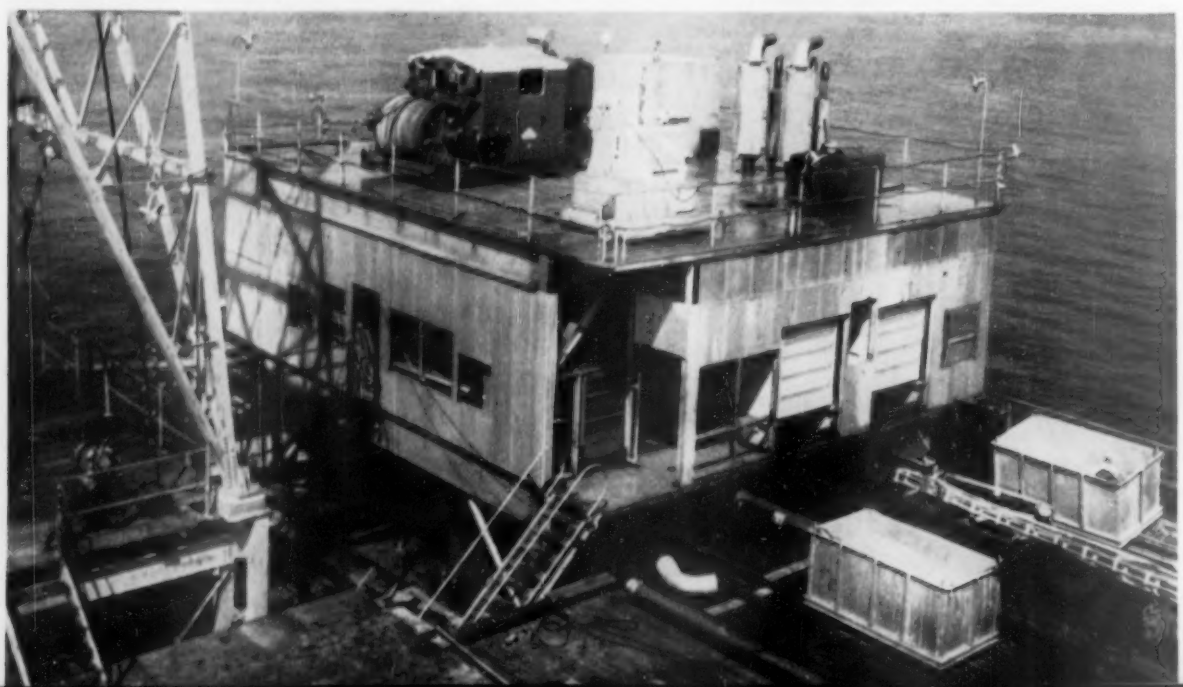
Whole outfit moved in three lifts

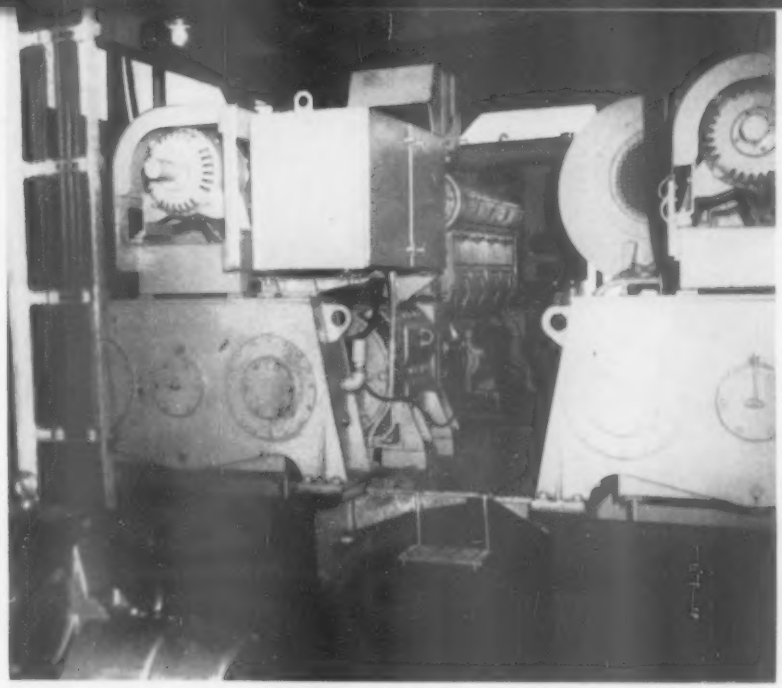
by Ed McGhee
District Editor

Diesel-Electric Rig Used on

Forty miles off Eugene Island, Louisiana, Phillips Petroleum Co. is drilling from a new platform with a diesel-electric rig on it. This article describes the rig and tells how it and other equipment were assembled for compactness, convenience, and efficiency on a platform only 85 by 140 ft. It also tells how Phillips unitized the rig for quick placement on the platform.

GENERATORS for the rig are housed in the building above and are driven by diesel engines. Fig. 3.





GENERATOR END of the power unit. The generators are driven by two identical diesel engines, rated at 875 hp. each. Fig. 4.

Permanent Offshore Platform

FOR its new Dome "A" platform, Phillips Petroleum picked a diesel-electric rig because it gives a greater flexibility in placing equipment. Company engineers wanted the derrick substructure to carry the least possible weight. The reason is that Dome "A" platform, like most offshore structures, is designed to drill at least six wells. To change from one hole to the next means skidding the derrick substructure and everything fixed to it.

By placing a diesel-electric rig on the platform, Phillips has kept the amount of equipment on the substructure down to that shown in Fig. 2. The cantilever support for the draw works extends only 10 ft. back from the derrick legs. With this compact arrangement, a "move" from one well to the next will compare favorably with "moving" time on the more expensive six-well derricks used on some platforms.

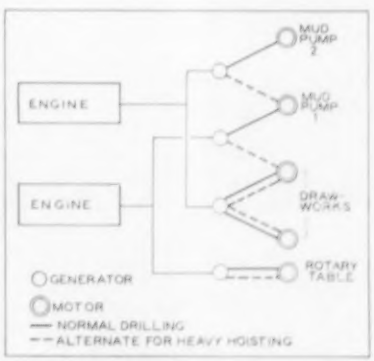
The diesel-engine-driven generators that supply power for drilling are part of the stationary package shown in Fig. 3. When the derrick and substructure are moved, only the mud and water lines, flow line, flexible conductors for power, and a blower line for air to cool the motors need be changed.

Forty miles out . . . The Phillips Dome "A" platform is in Block 184 of the Eugene Island area. To reach the location means a 40-mile trip from the nearest land, the Eugene Island light house. From Phillips' base of operations in Morgan City, La., it is 76 miles to the location. At the date of this writing, Dome "A" is still the most distant offshore of any platform yet constructed in the gulf. Water depth is 82 ft.

Transportation is presently by boats, but the platform has a landing deck to handle helicopters in case they are used later.

Company crews are doing the drilling.

Two diesel units . . . Power for drilling equipment comes from two identical 875-hp. diesel engines. These are eight-cylinder, 45° "V," two-cycle engines with 567-cu. in. piston displacement per cylinder. With only slight modifications, these 8-567-C engines are the same that the manufacturer, General Motors' electromotive division, uses for railroad power. Bore is 8½ in., stroke is 10 in., and the engines operate at either of two speeds, 600 or 835 r.p.m. The rated horsepower of 875 is at the higher speed.



POWER ARRANGEMENT for normal and heavy load hoisting. Fig. 6.

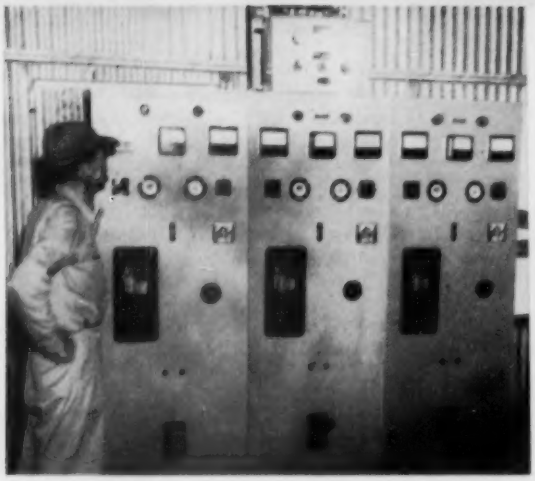
The cooling fans for the engines are driven off the lubricating-oil pumps. Eddy-current clutches control the speed of the fan from 260 to 1,050 r.p.m. Scavenging air comes from a Rootes blower, and jacket-water heat exchangers cool the motor oil. Each of the diesel engines drives two 502-kw. d.c generators. A fully ground shaft drives from the engine into a gear case, and the generators are driven off this case with a 1.66 to 1 ratio. Fig. 4 shows the generators end of the power units. Fig. 5 is the central panel for them.

Auxiliary power . . . Besides the two main diesels, the platform's power package has three Model 110 G.M. diesels driving single 130-kw, a.c. generators. Ordinarily, two of these generators will be in service at all times, and one will be on standby. Current from these generators is for two main purposes. First, it powers the lighting, air-conditioning, and miscellaneous loads. Second, a.c. power is rectified and used for control and separate excitation of the exciters for the big d.c. generators.

Motor-driven equipment . . . On Phillips' rig there are five d.c. motors driving drilling equipment. There is one on the rotary table, one on each of the two mud pumps and two on the draw works. These five motors are identical. They are rated 625-hp., and are cooled by blowers driven by 7½-hp. a.c. motors. Moreover, the d.c. generators are identical with the motors except that the generators have a separately excited field.

In normal drilling, only one generator supplies current to the two motors driving the draw works. However, as Fig. 6 shows, when the hoisting load becomes too much for the one generator, another generator can be put onto the draw-works motors. Since the two generators are driven by different engines, this arrangement, in effect, could put the full power of both diesel engines on the draw works.

Driller's control . . . At his position at the draw works, the driller has control of all the diesel-electric equipment. In Fig. 7 the control panel is immediately behind the driller. There is a complete speed-range forward and reverse con-



CENTRAL PANEL for the generators. Each of the two d.c. generators is rated at 502 kw. Fig. 5.

CONTROL PANEL directly behind driller enables complete control of all diesel-electric equipment. Fig. 7.

trol for each of the two mud pumps.

For safety there is provision for a total shutdown on the big engines and their generators. There is a second shutdown button for a.c. generators. Another control shuts off the generators' power without shutting down the engines themselves.

The driller's panel also carries warning lights and resets for overspeed and overload of the engines. Another warning light shows trouble in the 7½-hp. blowers that cool the motors. Plans are to install a hoist-limit alarm to guard against the traveling block being run into the crown.

Inertia brake . . . The draw works for Phillips' diesel-electric rig is an Emsco ECC, standard in most respects except for the inertia brake that has been added for the electric drive. This inertia brake is actually an air clutch on the draw-works jack-shaft extension where the coring-reel drive ordinarily goes. This clutch engages the draw-works frame to stop immediately and completely any rotation of the cathead in case injury threatens any worker. The brake also makes sure that the draw-works clutches can be engaged easily and quickly. Moreover, it is desirable to stop the series-wound d.c. motors completely before reversing them.

The mud pumps are two D-700 Emscos. Maximum liner diameter is 8 in., stroke is 16 in., and maximum input horsepower is 700. Fig. 8 shows the d.c. motor on the power end of one of these.

The mud-control center, Fig. 9, for the platform is beside the power package. It contains a mud centrifuge as permanent equipment.

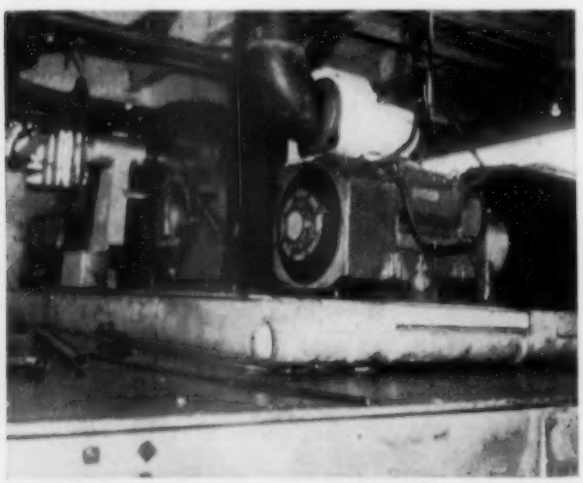
Unitized for quick placement . . . Because placing drilling equipment on a platform can be both expensive and time consuming, Phillips unitized as far as possible the rig for Dome "A" platform. Probably 95 per cent of the weight of the drilling equipment can be moved in only three lifts of a derrick barge. The first of these lifts is made up of the mud tanks, pumps, mud mixer, centrifuge, and shale shaker.

Another lift is the derrick substructure, draw-works, and derrick. When this unit was placed onto the platform, the derrick had already been built up to the fifth girt, and the remainder of the steel was stacked on the derrick floor. All this equipment weighs 135 tons.

The third main lift was the power package shown in Fig. 3. This included diesel engines, generators, and engine house. Total weight of lift is 225 tons.

To make placing of the rig on the platform even speedier, Phillips assembled the rig on a barge in inland waters. As much as possible, the rig was rigged up exactly as it would be for drilling. Then, when the platform was ready for the rig, this barge was towed to location, and the drilling equipment lifted onto the platform.

Acknowledgment . . . Credit is due to H. W. Patterson and M. T. Johnson, of Phillips drilling-tool division, and to John Boyd, of the production department, for assistance in preparing this article.



D.C. MOTOR on the power end of one of the mud pumps. Fig. 8.

MUD-CONTROL center is beside power package. Fig. 9.

Pipeliners Like Push-Button Station Control

Here's a box score on who, what, where, how many, and what's next on remotely controlled pipeline pumping stations

by E. B. Turner

THE oil-pipeline industry has gone further with the appplication of remote supervisory control equipment than any other industry.* To obtain an accurate picture of what has taken place and also to determine the trend of thinking in this respect, the author submitted questionnaires to a large percentage of the oil-pipeline operators. Respone was very heartening and what follows should be an accurate picture. It accounts for 93 per cent of all the trunk oil-pipeline mileage operated in this country and covers 50 remotely supervised stations.

In general the survey shows:

- Results with remotely supervised equipment now in use has been most encouraging.
- Reliability and reasonable cost of equipment and connecting communication links point to increasing use by the industry of remote operation.
- One-third of those companies having remote-controlled stations are now planning others.
- Fifty remotely controlled trunk-line stations are now in use. Future plans call for 35 others.
- Trend in design is toward transmission of less detailed information to remote operator. Alarms are grouped to describe type of fault instead of specific fault.

Most stations are manual . . . The majority of oil-pipeline stations in this country are attended and manually controlled, the degree of manual control varying widely with individual installations. On the one hand there are stations operating where the main valves are hand operated, motor starters are hand operated, and protection of the motor and pump units consists of continuous personal inspection by the operator.

On the other hand, there are stations where the main valves are power operated with their operations coordinated with the operation of the main motor pump units. All of the protective devices necessary for the protection of the motor pump units and the piping are tied into a common control circuit. This reduces the operation to the pressing of a start or stop button.

The trend in recent years has been toward the more automatic station with the intent of placing the station under some degree of remote control eventually.

There are a large number of stations which are between the manual operation and the automatic operation setup described above. The equipment installed in a typical semiautomatic pumping station usually consists of the following:

1. Main motor and pump.
2. Switchgear for incoming power, auxiliary power, and main motor starting.
3. Auxiliary control equipment for the station, motor and pump auxiliaries, and valve operators.

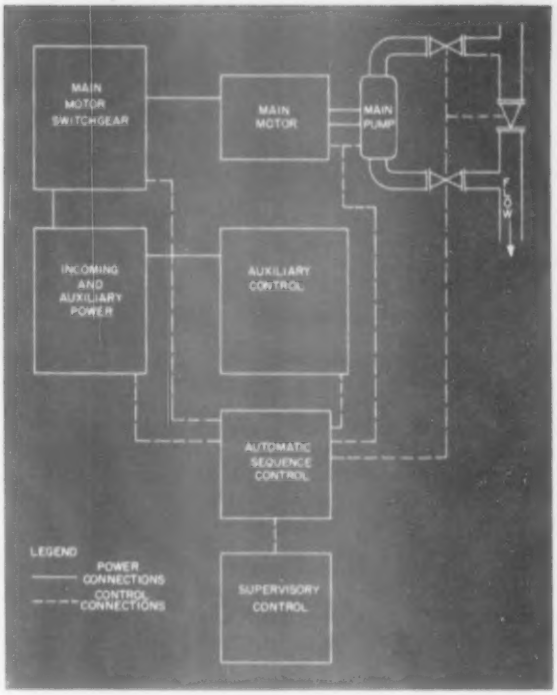
In order to arrive at an automatic form of operation an additional function called "automatic sequence control" must be added. The purpose of this equipment is to combine all the equipment in the "semiautomatic" station into a common control system, which is self-protecting. In other words, since there will be no operators present at the station, it is essential that the valuable equipment installed at these stations be protected.

This automatic-sequence-control equipment usually consists of a separate control panel, although this equipment has been built into so-called standard switchgear and motor control enclosures. Referring to Fig. 1 you can visualize how all of the components installed in the station feed into this automatic sequence control equipment in order to make the whole station function as a system.

With this automatic-sequence-control equipment installed we have automatic operation, except for the actual initiation of the start and stop of the motor-pump units. There are stations in existence which use a flow or pressure signal to automatically start and stop a motor-pump unit.

One system which has been designed and is as yet not installed incorporates this same principle into a multiunit station. It allows for the start and stop of four units from a differential pressure signal across the station throttling valve. This station will maintain a constant discharge pressure regardless of the flow conditions.

Supervisory control . . . The remotely supervised station uses remote supervisory control equipment, in addition to the equipment so far described. Under this term is classified all the control and indication functions which are necessary to intelligently control the sta-



SCHEMATIC of typical remotely supervised booster station. Fig. 1.

Author is engineer in systems application engineering section, General Electric Co., Schenectady, N. Y. Paper was presented at the Petroleum Electrical Conference, A.I.E.E., Houston, September 14-15, 1955.

*Excluding the electric utility operations.

tions from the remote point. For example, this may include the start and stop control of the pump units, alarm indications, and telemetering readings of pressures and flows.

The initial tendency usually is to reproduce at the remote-control point, all of the information which was formerly available to the local operator. It has become evident that all of the information which was available for local operation is not essential for remote operation.

Generally speaking, the only information and control which is required is start and stop of the units, indication of discharge or outbound line pressure and an indication of the type of fault or trouble which has shut the station down when such occurs.

For example, it is not necessary for the remote operator to know that it was the outboard bearing of the pump which shut the unit down. It is only of importance to him to know that a mechanical failure has occurred. When the mechanical maintenance man arrives at the remote station the local annunciator will indicate the specific cause of the trouble.

Therefore, the trend is to group the alarms so that they describe the type of fault without specifically identifying the individual fault.

Shutdown and alarm . . . Another aspect of this situation was the original use of manually reset alarms which made it necessary for an operator to take a trip to the station regardless of the cause of the shutdown. Some causes of shutdown are of short duration and of a nature that really does not require inspection before restarting of the unit.

These functions are being placed on an automatic reset basis, and only those which might require some form of maintenance are placed on a manual reset arrangement. This has served to make the remote-control systems more economical by requiring less supervisory control equipment and eliminating unnecessary trips to remote installations.

One method of operation which is between attended automatic and remote supervision is to have a caretaker-operator who is on call at all times, having voice communication with the controlling operator. By calling the caretaker-operator, the dispatcher can get full description of the trouble and determine exactly what should be done.

The number of telemeter readings and the number of alarms which are brought back is usually a balance between general operating practice and economics without sacrificing the operator's ability to perform the essential functions.

Present Status of Remotely Supervised Stations

Although this survey represents the oil-pipeline industry, the actual miles of oil pipeline which are remotely supervised total approximately 4,000 out of 83,870.* This is something less than 5 per cent of total trunkline mileage. However, this represents 50 remotely supervised stations.

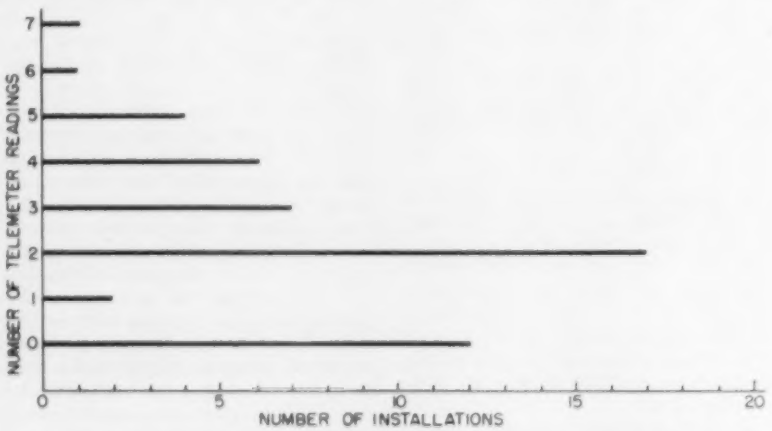
A distinction should be made between unattended automatic stations and remotely supervised stations.

Unattended automatic station: For purposes of this paper a station which operates automatically without remote supervision. For example, stations which operate from a pressure or flow signal (starting and stopping by signals at the local installation without remote control of the start and stop function), will be considered unattended automatic stations.

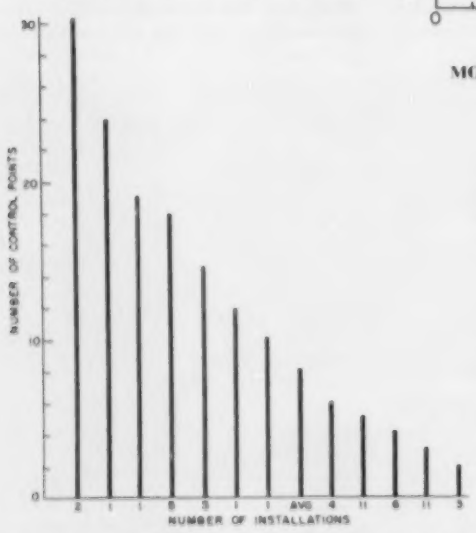
Remotely supervised stations: One in which the start-and-stop function is available at the controlling point although the station operation is automatic.

To give a specific picture of the presently installed systems, let us examine the following features of **remotely supervised stations.** (This does not include

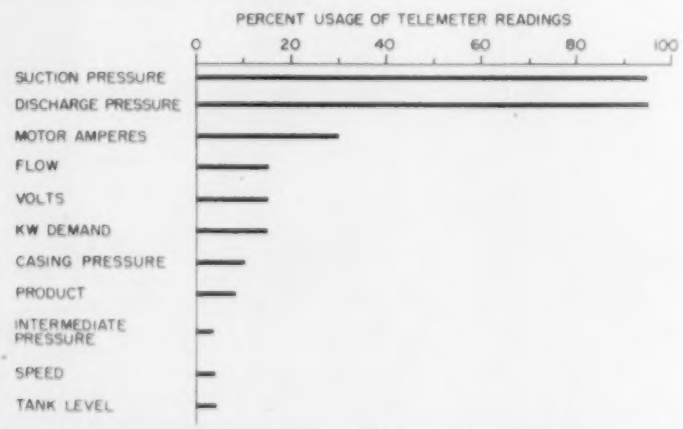
*ICC Statement No. 5428.



MOST STATIONS have few telemetered readings; trend is toward fewer. **Fig. 3.**



CONTROL POINTS vary from 2 to 30 in the 50 existing stations. **Fig. 2.**



WHEN TELEMETERING IS USED, here's how various functions rate on a per cent basis. **Fig. 4.**

installations which are considered part of gathering systems.)

1. Type of supervisory control system.—Basically, there are two types of supervisory control systems. These are the relay type and the so-called tone type. At the present time 58 per cent of the remotely controlled stations use relay-type supervisory equipment. The remaining 42 per cent have tone-type supervisory equipment. On a company basis 78 per cent use relay-type with 22 per cent using tone-type supervisory equipment.†

There are in operation both relay-type and tone-type supervisory equipment designed and built within the operating companies' organizations. There are seven stations of this type.

Relay-type supervisory equipment usually employs a series of d.c. pulses. Signals are coded by varying the number of pulses or the length of the spaces between the pulses. These coded signals are received by a relay circuit chain which operates a specific control relay for a specific signal.

Tone-type supervisory equipment uses a signal consisting of either a series of audio tone pulses or a single pulse containing several audio tones. The coding is obtained by the presence or absence of various audio tones. These coded signals are received by frequency-sensitive circuits which ultimately energize a specific relay for a specific signal.

2. Control points.—The control points which are available at the remote control point are defined such that the start and stop of a unit are two separate points. This is to place all available systems on the same basis and to give a more accurate idea of the number of separate and distinct operations which have been used. Fig. 2 shows the number of control points per installation varies from a maximum of 30 to a minimum of 2, with the average number being 8. Older installations of supervisory equipments within the same company usually show 50 to 100 per cent more points per unit than the newer installations.

It is interesting to note that about 80 per cent of the stations are completely unattended. The remaining 20 per cent are normally attended only part time, or the attending operator's main function is operation of auxiliary terminal equipment rather than pumping units.

3. Availability.—Availability is defined as the percentage of time that the supervisory control equipment is available for operation. The answers which were received to this question vary from 100 per cent availability to 90 per cent availability, with the average being approximately 98 per cent. In all instances this has proved to be at least as good as the connecting link used, regardless of type.

4. Connecting links.—The connecting link is defined as any means used to transmit the supervisory control signals from the control point to the remote location. The connecting links in use are:

1. Bell Telephone System.
2. Private wire line.
3. Microwave.

The largest connecting link accounting for 52 per cent of the existing installations is the Bell Telephone System. This includes both telegraph-type circuits and voice channels. The relay-type supervisory control can sometimes use the less expensive telegraph type circuit whereas the tone type supervisory control requires the more expensive voice channel.

Private wire-line installations total 20 per cent. The trend in this case seems to be that pipeline companies are getting out of the pole and wire business.

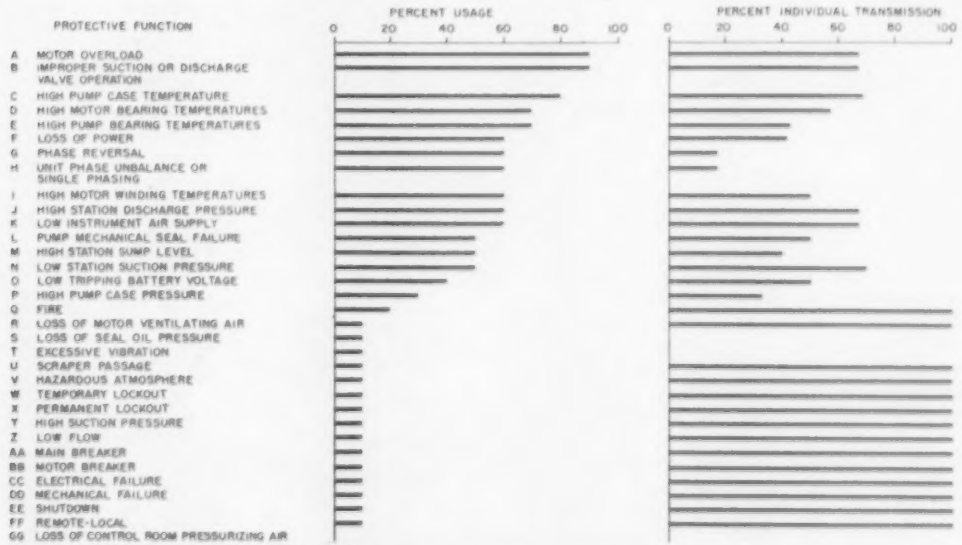
Microwave is used in 28 per cent of the existing installations. There is not sufficient data to indicate the existence of a trend in the use of this connecting link. In the installations covered by this survey, voice communication usually utilized more channels than the supervisory control functions.

Sometimes it may be considered expedient to place a number of remote installations on a common system similar to a party line. This can be done with either type of supervisory equipment. In this instance the relay-type supervisory control usually requires some auxiliary audio tone equipment. A voice circuit is required when the audio tone equipment is used.

Under these conditions, a larger number of remote operations can be performed using relay-type supervisory equipment on one voice circuit than can be performed using available tone-type supervisory equipment.

Although there may be some slight economic advantage to a common system, it has some operational disadvantages. Principally, the loss of the common channel means complete loss of supervision. At the present time 62 per cent of the existing installations are common systems. This represents the thinking of 43 per cent of the compa-

†Included in the relay-type designation are the installations using Bell Telephone System equipment.


PROTECTIVE FUNCTION
PERCENT USAGE
0 20 40 60 80 100
PERCENT INDIVIDUAL TRANSMISSION
0 20 40 60 80 100
A MOTOR OVERLOAD
B IMPROPER SUCTION OR DISCHARGE VALVE OPERATION
C HIGH PUMP CASE TEMPERATURE
D HIGH MOTOR BEARING TEMPERATURES
E HIGH PUMP BEARING TEMPERATURES
F LOSS OF POWER
G PHASE REVERSAL
H UNIT PHASE UNBALANCE OR SINGLE PHASING
I HIGH MOTOR WINDING TEMPERATURES
J HIGH STATION DISCHARGE PRESSURE
K LOW INSTRUMENT AIR SUPPLY
L PUMP MECHANICAL SEAL FAILURE
M HIGH STATION SUMP LEVEL
N LOW STATION SUCTION PRESSURE
O LOW TRIPPING BATTERY VOLTAGE
P HIGH PUMP CASE PRESSURE
Q FIRE
R LOSS OF MOTOR VENTILATING AIR
S LOSS OF SEAL OIL PRESSURE
T EXCESSIVE VIBRATION
U SCRAPER PASSAGE
V HAZARDOUS ATMOSPHERE
W TEMPORARY LOCKOUT
X PERMANENT LOCKOUT
Y HIGH SUCTION PRESSURE
Z LOW FLOW
AA MAIN BREAKER
BB MOTOR BREAKER
CC ELECTRICAL FAILURE
DD MECHANICAL FAILURE
EE SHUTDOWN
FF REMOTE-LOCAL
GG LOSS OF CONTROL ROOM PRESSURIZING AIR

PROTECTIVE FUNCTIONS in use, showing per cent use of each and per cent of which are individually transmitted to controlling point. Fig. 5.

nies utilizing remotely controlled systems.

The trend, regardless of the type of operation, is toward controlling a larger number of remote installations from one central location.

5. Continuity.—Continuity is defined as the method of operation which allows the remotely controlled station to continue to operate in a self-protected manner upon the loss of the supervisory control signal or the connecting channel.

With only one exception all of the presently installed remotely supervised installations continue to operate until the supervisory signal is available or until some trouble shuts the unit down.

6. Distances.—There is considerable variation in the systems installed. The minimum distance appears to be 10 miles with a maximum distance of 900 miles. The average distance from a control point to a remote installation is 100 miles. At the present time, the longest system uses Bell Telephone System circuits. The longest system using microwave is approximately 750 miles.

7. Telemeter equipments. — Telemetering is the remote reproduction of any measured quantity. Here again, there is a wide variation in the number of readings and also the types of readings which are utilized. For example, 25 per cent of the installations have no telemeter readings whatsoever; 65 per cent have four telemeter readings or fewer; only 10 per cent have five or more telemeter readings (see Fig. 3).

Of those that have telemeter readings, only 18 per cent are available on a continuous basis; the others have installations where the desired telemeter reading is selected. Fig. 4 shows that the readings which occur most frequently are suction and discharge pressure.

8. Equipment cost.—This includes all supervisory control equipment and telemetering equipment, excluding any automatic-sequence-control equipment which is installed at the station. Although this latter equipment is essential to operation of the supervisory control equipment, the station is not operable remotely without addition of the supervisory control and possibly telemetering equipment.

This is a difficult item to average out since the various installations have different number of points and use different supervisory systems. For example, those systems which use Bell telephone supervisory would not expect as large an equipment cost. This equipment must be rented on a monthly basis. This is factored in by capitalizing the yearly rental on a 20-year amortization basis.

Considering all these factors, an equipment cost per unit of installation (considering one motor and pump as a unit) would be approximately $9,800 exclusive of the connecting link. This includes four telemetering readings, eight control points, and auxiliary equipment necessary for the proper functioning of the system. It must be emphasized that this is an **average** figure in every sense of the word.

9. Protective functions. — Protective functions are those functions of a protective nature which are used with the pumping equipment.

Only a comparatively small number of these functions are made available at the controlling point on more than 70 per cent of the remotely supervised installations.

Fig. 5 identifies the protective functions and indicates the per cent usage of each. It should be noted that functions b, w, x, cc, dd, and ee are definitely of a group type and actually include other individual type functions. Fig. 5 also indicates the per cent that are transmitted as individual functions.

Consideration should be given to both parts of Fig. 5 in determining if it is desirable to transmit a specific function individually. Basically the criterion should be, **"Does it contribute to the information essential for intelligent operation?"**

Typical Remotely Supervised Installation

With the foregoing as background, the author would recommend the following features in a typical remotely supervised oil pipeline pumping station: (It is assumed that the station is already set up for attended automatic operation as previously described.)

Control Functions

1. Start-and-stop control and indication for each of the individual motor-pump units in the station.
2. Raise-hold-lower control of discharge pressure controller.*

Alarms

1. Electrical failure (common for all units in the station-manual reset).
2. Mechanical failure (common for all units in the station-manual reset).
3. Temporary shutdown (common for all units in the station-automatic reset).

Telemeter Readings

1. Station suction pressure.
2. Station discharge pressure.
3. Position of discharge pressure controller set point.*

Individual pipeline operators may find that it is desirable to have additional control or indication functions but these are considered essential. This typical remotely supervised station (assuming a single motor-pump unit), has seven control, indication, and alarm points and three telemeter readings. The availability of the system operating over a 100-mile Bell Telephone System link is approximately 98 per cent. The telemeter readings are available on a select-as-desired basis.

The complete equipment cost for the remote supervisory control system, excluding the connecting link, is approximately $7,000.

*These operations may not be required in the simpler booster stations.

Conclusion

The results which have been obtained with the use of the presently installed remotely supervised equipment are most encouraging. The reliability of the equipment and the connecting link, the reasonable cost of the equipment, all encourage increased usage of this type of operation.

An indication of this is shown by the fact that of the companies who are at present operating this type of system, 35 per cent have stations in the planning stage, representing an increase of 65 per cent over the total number of stations presently operating.

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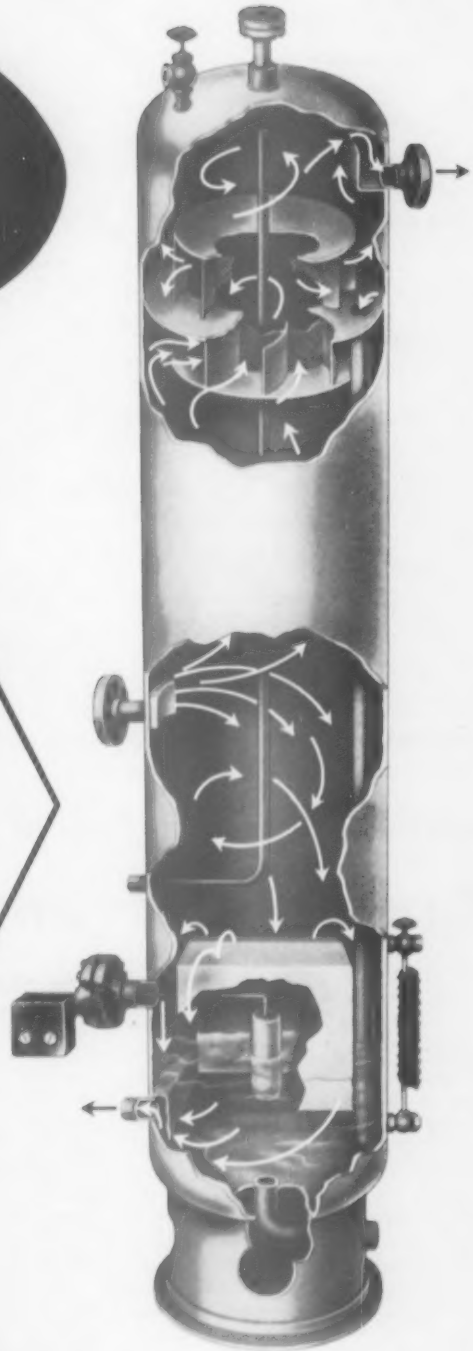

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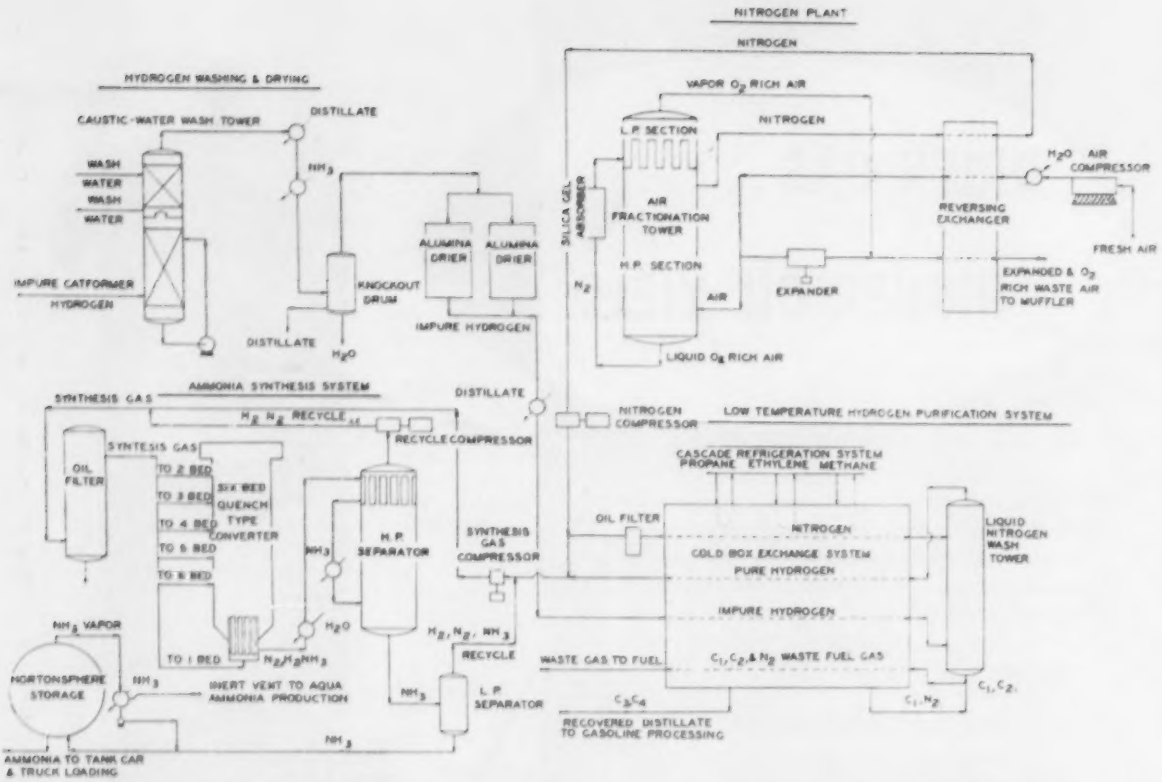


SIMPLIFIED FLOW DIAGRAM of Atlantic Refining Ammonia Plant—first to use byproduct hydrogen from cat reforming unit. Fig. 1.

Atlantic Refining produces 100 tons per day of anhydrous . . .

Ammonia From Catformer Tail Gas

by J. H. Arnold and W. T. Dixon

A NEW 100-ton per day anhydrous ammonia plant has been in operation at the Philadelphia refinery of Atlantic Refining Co. for about 1½ years. The plant is designed to produce a single primary product, anhydrous ammonia, at a nominal rate of 100 tons per day. The plant also recovers propane and heavier hydrocarbons from the byproduct gas as a liquefied stream, and the lighter hydrocarbons as fuel gas. The plant was designed and constructed by Hydrocarbon Research, Inc., of New York.

The gas used as a source of hydrogen comes from an Atlantic Catformer, a catalytic reforming process developed by Atlantic Refining Co.

This is the first ammonia plant to use the hydrogen-rich byproduct gas from a catalytic naphtha reformer as a source of hydrogen. Unusual purity of synthesis gas permits operation at pressures below 3,000 psig. without purging of inerts. The synthesis gas prepared from the Catformer gas is so pure that the small quantities of other gases which it contains are readily soluble in the liquid ammonia product leaving the 400-psig. let-down tank.

The two basic steps in the preparation of the synthesis gas, the fractionation of nitrogen from air and the washing of the Catformer gas with liquid nitrogen, are both carried out in a single, compact cold box. The two sections are designed to operate indefinitely without deriming.

Pure oxygen is not separated from air simultaneously with the nitrogen since it is not required by the process. However, the nitrogen separation plant is designed so that the necessary additional equipment can be added at a later date should the need for pure oxygen arise.

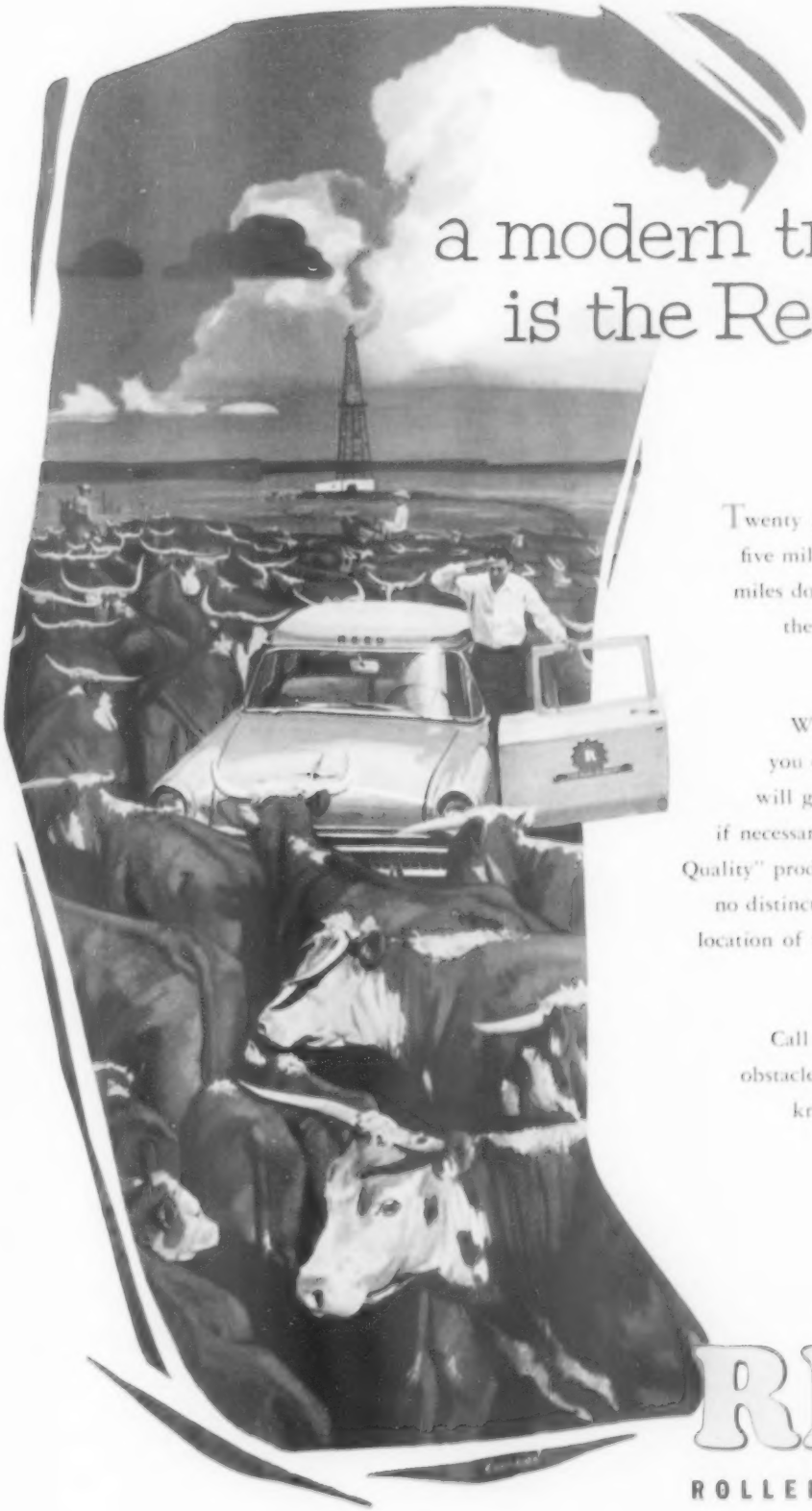
The hydrogen separation plant is also designed to process a blend of water gas and Catformer gas should, for any reason, the necessary quantity of Catformer gas not be available to the ammonia plant.

The ammonia synthesis is carried out in a single converter and the product is separated in a single high-pressure separator. The synthesis is carried out at pressures below 3,000 psig.

A conversion of 97 per cent of the hydrogen contained in the Catformer gas to a refrigeration-grade liquid ammonia product is made possible by the elimination of the necessity of purging the converter recycle and by the use of a simple, pressure-tight system throughout the plant.

The two Catformer gas analyses shown in Table 1 were used as bases for design of the ammonia plant. The

J. H. Arnold is consultant, Hydrocarbon Research, Inc., (present address is 174 Blackburn Road, Summit, N. J.); W. T. Dixon is with Atlantic Refining Co.



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actual Catformer gas generally has been richer in hydrogen than Case A analysis. With this feed, the production rate has gone well over 100 tons per day. At other times the plant has operated on gases which approach the lower hydrogen analysis of Case B, Table 1.

Atlantic Ammonia Plant

A simplified flow sheet of the plant is shown in Fig. 1. The process equipment is divided into three main functional groups: (1) the nitrogen separation plant, (2) the hydrogen-purification plant, and (3) the ammonia synthesis and recovery plant.

Hydrogen purification . . . The plant purifies the hydrogen from the Catformer by refrigeration followed by washing with liquefied nitrogen at low temperature. The nitrogen required for washing the hydrogen and the synthesis of ammonia is separated from air by liquefaction and distillation at low temperature. The synthesis of ammonia from the mixture of hydrogen and nitrogen is effected at a relatively low pressure over a typical doubly promoted iron catalyst. The ammonia product is liquefied by cooling the synthesis reactor effluent in two stages, to 100° F. using water, and to 25° F. using ammonia refrigeration. The liquefied ammonia product flows directly from the recovery system to the product storage spheres.

The only pieces of major equipment provided in duplicate are the acetylene adsorbers, and the Catformer gas driers. The feed air compressor of the nitrogen-separation plant and the recycle-gas circulating compressor of the ammonia-synthesis plant are each single units. Other large compressors are each provided as two half-size units. No spare cold equipment is provided for deriming the exchangers in the hydrogen separation plant nor are these operated on a switch basis. There is a single ammonia-synthesis converter and a single ammonia-recovery system including a single high-pressure separator.

Electric-motor driven . . . The compressors which consume the bulk of the power required to operate the plant are driven by electric motors. The larger compressors are driven by unity-power-factor synchronous motors since this type of load best suits the over-all refinery power balance. The total electrical load is approximately 4,000 kw. The steam requirement is under 2,500 lb. per hour and the circulating cooling water rate is under 4,000 g.p.m.

The plant is situated on a plot 176 by 274 ft. There are two buildings; the larger building houses the compressors and some of the associated intercoolers, aftercoolers, and drums. The smaller building is the control house which shelters the principal control instruments and synthesis converter valve operators. All other equipment is located outdoors.

The air to be liquefied and fractionated in the nitrogen-separation plant is drawn from the atmosphere immediately outside the compressor house. It is filtered and then compressed to approximately 80 psig. in a seven-stage diaphragm-cooled centrifugal compressor driven through a gear by a synchronous motor. The compressed air is cooled in a conventional water-cooled tube-and-shell exchanger and the water condensate is separated in a vertical drum which also acts as a surge drum. Reversing exchangers are used to further cool the compressed air to essentially its liquefaction temperature and to remove the residual water and the carbon dioxide.

SCALE MODEL of co'd box. Fig. 2.

Reversing exchanger assembly . . . This consists of a number of brazed-aluminum extended surface heat-exchanger units. The exchangers are manifolded into batteries, each battery consisting of three exchanger units in parallel and two exchanger units in series. Each battery is mounted vertically and the corresponding stream connections of the individual exchanger units are manifolded at top and bottom.

Each exchanger unit has a cross-section of 17 by 20⅞ in. and a length of 106½ in. There are 50 individual passes per exchanger which are divided between the streams exchanging heat in accordance with the heat-transfer requirements. Each pass has 15 fins per inch of width running the length of the pass. The fins are 0.375 in. tall and 0.008 in. thick and they are both corrugated and serrated.

Low-temperature separation . . . The chilled compressed air is liquefied and distilled in a fractional-distillation column at approximately 68 psig. into a high-purity gaseous nitrogen stream overhead and an oxygen-enriched liquid bottoms. The liquid bottoms are subcooled external to the tower, passed through silica gel to remove traces of acetylene and then expanded into a condenser-evaporator at the top of the distillation tower. The expanded liquid vaporizes completely in the condenser-evaporator, thereby condensing nitrogen reflux at the top of the distillation tower.

The distillation column has an internal diameter of 54 in. and is approximately 34 ft. tall. The shell and heads are fabricated of stainless steel and the trays, bubble caps, and downcomers are of aluminum. The tray spacing is 4 in. and the tray seals are specially designed to avoid bypassing of the trays by even minute quantities of gas which adversely affects the purity of the product. The condenser-evaporator at the top of the tower consists of light drawn copper tubes rolled into stainless-steel tube sheets.

Flow reversal . . . The nitrogen product from the top of the distillation column and the waste stream from the con-

denser-evaporator both flow back out the reversing exchanger, thereby chilling the incoming compressed air. Every 15 minutes the flow of compressed air and of waste gas through the reversing exchanger is revised, i.e., the compressed air is caused to flow through the passes previously carrying waste gas and the waste gas is caused to flow through the passes previously carrying compressed air. In this manner the residual water and carbon dioxide deposited from the compressed air during one-half cycle are revaporized into the waste gas and carried out of the exchanger during the next half cycle. The high-purity nitrogen flows through the special nonreversing passes of the reversing exchanger to prevent contamination with air or waste gases.

Turbo-expander . . . The refrigeration requirement of the nitrogen separation plant is supplied by expanding chilled air from approximately 72 psig. and minus 245° F. to about 4 psig. and minus 307° F. The air is expanded through a single stage turbo-expander turning at a speed of 25,000 r.p.m. The single turbine wheel is 5 in. in diameter and it is directly connected by a single shaft to a two-stage oil pump. The first stage is a jet pump used primarily to force lubricant through the bearings. The second stage is a single impeller used primarily to absorb power. The single shaft is less than 12 in. long. Power is generated at one end at temperatures well below minus 200° F. and absorbed at the other end at temperatures above plus 100° F. The combined turbine and pump assembly is about 30 in. long, 10 in. in diameter, weighs less than 50 lb., and is capable of developing and absorbing over 40 hp.

Cold box . . . All equipment of the nitrogen-separation plant is enclosed in a rectangular box made of structural steel with sheet-steel sidings. The space within the box not occupied by equipment is packed with mineral wool. Bonnets of all operating valves extend through the cold box wall so that the valves can be repacked without entering the cold box.

Essentially all of the equipment inside the cold box, exclusive of the condenser-evaporator tubes, is either stainless steel or aluminum. The choice between one or the other material was based chiefly on the relative costs. Special transition joints similar to Van Stone flanges are used for connections between aluminum and stainless steel.

The Hydrogen-Separation Plant

The Catformer gas arrives at the ammonia plant at ambient temperature at approximately 400 psig. All Catformer gas arriving at the ammonia plant is processed as received. It is first processed to remove hydrogen sulfide and water vapor which would otherwise solidify in the cold exchangers of the hydrogen-separation plant. The hydrogen sulfide is removed from the gas by caustic washing in the lower section of a double tower and any caustic entrainment is removed by water washing in the upper section of the same tower. The hydrogen sulfide-free gas is then partially dried by refrigerating at 50° F. and further dried over activated alumina to a dew point of minus 80° F.

The hydrogen sulfide and water-free gas is then cooled in a series of brazed-aluminum extended surface exchangers and washed with liquid nitrogen. Hydrocarbons condensing from the gas as it is chilled prior to the nitrogen wash are removed from the gas in four separators at four temperature levels. The liquids from the first two separators are blended to form the byproduct liquid mixture of propane and higher hydrocarbons. The liquids from the last two separators are evaporated into the byproduct fuel gas.

The nitrogen leaving the nitrogen-separation plant is boosted to about 400 psig. in two stages of the multicylinder reciprocating compressor directly coupled to a synchronous motor. The portion of the compressed nitrogen to be liquefied for washing hydrogen is cooled in some of the same brazed-aluminum exchangers used to cool the Catformer gas.

Exchangers similar . . . The exchangers used to cool the Catformer gas and the nitrogen to be liquefied are similar in construction to the reversing exchangers previously described as a part of the nitrogen-separation plant. They are somewhat smaller in cross-section, have fewer passes, and are designed to withstand the full pressure of the Catformer gas. Twenty-seven individual exchangers are manifolded in series and in parallel as required by the flow and duty of each step of the cooling and multiple-stage separation of the hydrocarbon condensates.

Nitrogen wash . . . The chilled Catformer gas enters the nitrogen wash tower just below the bottom tray. Liquefied nitrogen enters the tower on the top tray. The washed hydrogen leaves the top of the tower as a vapor essentially free of hydrocarbons and oxygen but containing about 10 per cent of nitrogen. The condensed hydrocarbons and the residual liquefied nitrogen leave the bottom of the tower as a liquid mixture and are vaporized into the byproduct fuel gas external to the tower, thereby furnishing refrigeration to liquefy a part of the nitrogen used for washing and to help cool the Catformer gas.

The nitrogen wash tower has an internal diameter of 2 ft. and is approximately 28 ft. tall. The shell and heads are fabricated of stainless steel and the trays, bubble caps, and downcomers are aluminum. The tray spacing is 8 in. and tray seals, like the tray seals of the nitrogen-separation tower, are specially designed to avoid bypassing of the trays by even minute quantities of gas which would adversely affect the purity of the product.

Cascade refrigeration system . . . This provides the net refrigeration requirement for cooling the Catformer gas, condensing the hydrocarbons from the Catformer gas, and cooling and liquefying the nitrogen used for washing. The steps of the cascade are propane, ethylene, and methane. Each refrigerant is compressed in two stages using two cylinders of a six-cylinder reciprocating compressor directly driven by a synchronous motor. A single 450-hp. machine handles all three services. Two identical 450-hp. machines are provided, each designed for one-half total load. Thus when operating on Case A feed, one machine can be shut down.

Each refrigerant is vaporized at a slight positive pressure. Refrigeration is utilized at all three temperature levels. Refrigeration at the propane and ethylene levels is utilized principally to condense hydrocarbons from the Catformer gas. Refrigeration is utilized at the methane level to liquefy nitrogen. The refrigeration output of each system is automatically controlled to meet normal fluctuations in load. Clearance pockets are also provided.

The cascade compressor cylinders are lubricated with a high-grade petroleum oil and special traps are used to remove oil entrained in the refrigerant before it enters the subatmospheric-temperature section of the cascade.

Two-section cold box . . . The equipment of the hydrogen-separation plant, including the refrigeration cascade, operating at subatmospheric temperatures, is enclosed in the same cold box which encloses the nitrogen-separation equipment. The two sections are separated by an internal partition which permits access to one section without disturbing insulation in the other. Bonnets of all operating valves extend through the cold box just as they do on the nitrogen-separation plant. Conventional instruments are also used with the working parts mounted external to the cold box. Essentially all the process equipment within the cold box is either stainless steel or aluminum. The compact arrangement of equipment within

the cold box is illustrated by the photograph of the scale model of the cold box, Fig. 2.

The Ammonia Synthesis Plant

The entire output of washed hydrogen from the hydrogen-separation plant plus the necessary pure nitrogen are mixed to form a 3:1 hydrogen-nitrogen synthesis gas, and the mixture is further compressed in two stages in two cylinders of the multicylinder reciprocating compressor, the other cylinders of which are used to compress pure nitrogen to about 400 psig. as previously described.

Guard . . . The synthesis gas does not normally contain any significant content of free oxygen or carbon monoxide. However, as a precautionary measure the synthesis gas as it leaves the first stage of the compressor is heated by steam in a conventional tube-and-shell exchanger to approximately 400° F. and then flows through a guard chamber which contains a reduced copper-nickel catalyst. Traces of free oxygen or carbon monoxide present inadvertently in the synthesis gas are converted to water vapor and methane respectively and thus the synthesis circuit is clear of free oxygen or carbon monoxide at all times.

The compressed synthesis gas joins the recycle gas from the ammonia-recovery system and enters a specially designed oil filter to remove any compressor lubricating oil entrained by either the synthesis gas or the recycle gas.

Conversion . . . The oil-free mixture enters the ammonia converter. The bulk of the mixture flows through the heat exchanger located in the base of the converter where it is heated to essentially reaction temperature by the converter effluent. The preheated mixture flows up the central transfer tube of the converter and then reverses direction and flows down over the catalyst.

Cold gas bypassing the heat exchanger is injected between the vertical beds of catalyst as the main gas stream flows downward over the catalyst thus tempering the reaction and spreading it out over all catalyst beds. The converter also has a multilayer steel shell. The top and bottom heads are forgings. The multilayer shell serves only as a pressure case for the actual converter. The converter proper has a light alloy steel shell insulated on the outside, and the cold feed gas entering the reactor first flows along the annulus between the inner wall of the pressure case and the insulated outer wall of the alloy shell, to keep the pressure case cool. There are six catalyst beds arranged in series vertically and provision is made to add cold gas between all beds which controls the temperature of the gas mixture entering and leaving each bed. The converter proper and the heat exchanger can be withdrawn as a single unit through the top flange of the pressure case.

Electric heater . . . The central transfer pipe of the converter, which carries the hot effluent from the heat exchanger to the entrance to the first catalyst bed, is equipped with an electrical heater. This heater furnishes heat for the initial reduction of the catalyst and to heat the catalyst up to reaction temperature whenever the converter is started cold. The heater has a nichrome ribbon element. Single-phase current is supplied to the heater with a maximum power input of 300 kva. Regulation of power input is afforded by a reactrol transformer capable of varying the voltage across the heating element from 69 volts to 220 volts. The electrical leads from outside the converter to the internal heater pass through a special pressure cast nonmetallic seal, which is absolutely gastight at pressure far exceeding the design synthesis pressure.

The effluent from the catalyst beds passes through the heat exchanger and on to the water cooler where it is cooled to about 100° F. The effluent is further cooled to about 25° F. as it flows through an exchanger counter to the cold recycle gas and then through a chiller refrigerated by evaporating ammonia. The chilled effluent then flows to a separator. The vapor from the separator, which is the recycle gas, flows back through the cold exchanger and on to the circulator to be returned to the reactor.

The circulator is a single-stage reciprocating compressor direct driven by a synchronous motor. The recycle gas leaving the circulator meets the fresh feed at the entrance to the oil filter and the cycle is completed.

Flash . . . The condensed ammonia from the high-pressure separator is flashed to approximately 400 psig. in a second separator and the flashed liquid flows under its own pressure to either of two 48-ft. Hortonspheres. The flashed gas flows to the suction of the synthesis gas compressor and is thus returned to the converter. No purge of inerts is necessary from the synthesis system.

The ammonia product is pumped from storage by means of multistage vertical pumps to racks for loading into either railway tank cars or tank trucks.

The ammonia refrigeration system used principally to condense the ammonia in the reactor effluent has two stages of compression with direct-contact interstage cooling to reduce the power requirement. The compressor is direct driven by a 400-hp. synchronous motor. Clearance pockets are provided to permit a 25 per cent reduction in capacity. Manual bypass valves are also provided. Slight variations in load are met by a compensating change in suction pressure.

Design Operating Specifications

The plant is designed to process 8 M.M.c.f.d. of Catformer gas and to convert 97 per cent of the hydrogen contained in the Catformer gas to ammonia in the product storage tanks.

The plant is also designed to recover a minimum of 96 per cent of the propane and heavier hydrocarbons as a liquid product. This percentage amounts to 210-430 bbl. per day for the Catformer gas analyses shown in Table 1.

TABLE 1—ANALYSIS OF PLANT FEED

	Approximate compositions	
Hydrogen-rich stream—	Case A	Case B
Flow rate, M.M.s.c.f.d.	8	8
Component:		
H_2S, grains per 100 cu. ft.	10	10
	Mole, per cent	
H_2	95.0	86.6
CH_4	0.6	3.2
C_2H_6	0.6	2.5
C_3H_8	1.9	4.6
$i\text{-}C_4H_{10}$	0.7	1.2
$n\text{-}C_4H_{10}$	0.5	0.9
$i\text{-}C_5H_{12}$	0.2	0.4
$n\text{-}C_5H_{12}$	0.1	0.2
C_{6+}	0.4	0.4
Total	100.0	100.0

The nitrogen-separation plant is designed so that the idle plant at ambient temperature can be brought on stream producing the full output of pure nitrogen in 48 hours. The plant is also designed so that it can be bottled up in the event the air flow is interrupted, and can be restarted cold without deriming after periods of idleness up to 6-8 hours. The plant is also designed so that it can be shut down almost instantaneously and can be warmed to ambient temperature in less than 24 hours.

The reversing exchangers are designed to trap and eliminate essentially all the residual water and carbon dioxide contained in the compressed air so that the plant can be operated indefinitely without any type of chemical cleanup or predrying of the air, and without interruption of the operation to derime the reversing exchanger or other cold equipment.

The silica gel adsorbers are designed to prevent indefinitely the concentration of the acetylene from reaching a dangerous level in the condenser evaporator.

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The nitrogen - separation plant controls are designed so that normal fluctuations in the demand for pure nitrogen by the hydrogen separation or ammonia synthesis plants are handled at the nitrogen - separation plant simply by adjustment of the pure nitrogen drawoff valve. For larger changes such as those required by deliberate, substantial changes in ammonia production rate, the adjustment of the pure nitrogen can be coupled with a corresponding adjustment in the output of the feed air compressor.

The nitrogen-separation plant is designed to produce a nitrogen product containing not more than 25 p.p.m. of oxygen.

The hydrogen-separation plant is designed so that in a period of not more than 72 hours its cascade can be charged with refrigerants and the plant cooled to operating temperatures. The plant is also designed so that it can be maintained cold indefinitely using pure nitrogen in place of Catformer gas in the event the Catformer gas flow is interrupted. By this means the cold plant can be restarted after an indefinite period of idleness and be producing essentially pure hydrogen in a matter of a few hours after Catformer gas flow is reestablished. The plant is also designed so that it can be shut down essentially instantaneously and can be warmed to ambient temperature in less than 24 hours.

The hydrogen-separation plant is designed to run indefinitely without deriming of any equipment.

The plant controls are designed so that all the available Catformer gas flows into the plant and so that normal fluctuations in the flow of Catformer gas are handled with no adjustment of the hydrogen - separation plant other than the adjustment of the refrigeration cascade to the change in load and this adjustment is mainly automatic. For larger changes such as those required by deliberate substantial changes in ammonia production rate, the automatic adjustment of the cascade is coupled with a compensating manual adjustment of the flow controller regulating the quantity of nitrogen being liquefied.

The hydrogen-separation plant is designed to produce a washed hydrogen such that the 3:1 hydrogen-nitrogen synthesis gas contains less than 10 p.p.m. of oxygen and less than 100 p.p.m. of argon and other inerts.

The high - pressure synthesis equipment of the ammonia synthesis plant is designed for a maximum operating pressure of 3,800 psig. but the plant is designed to produce the rated production of ammonia at pressures below 3,000 psig. and without requiring purging the recycle of inerts.

In actual operation the plant has met and exceeded each of the design operating specifications enumerated above.

Acknowledgment

The authors wish to express their thanks to J. D. Peterson and E. M. White, of Atlantic Refining Co., and to E. A. Kelly and M. C. Sze, of Hydrocarbon Research, Inc., for assistance in the preparation of this manuscript.

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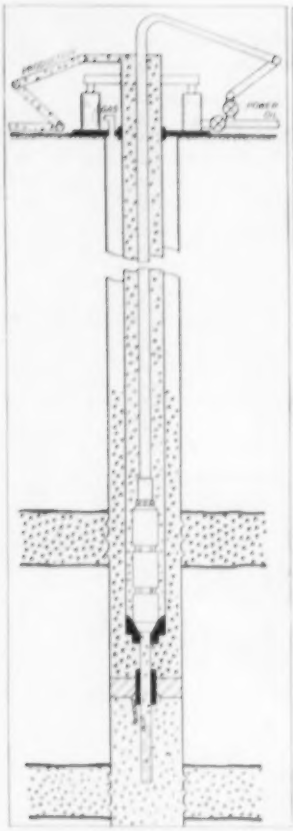

Fig. 1 — Zones pumped alternately through production intake being raised and lowered.

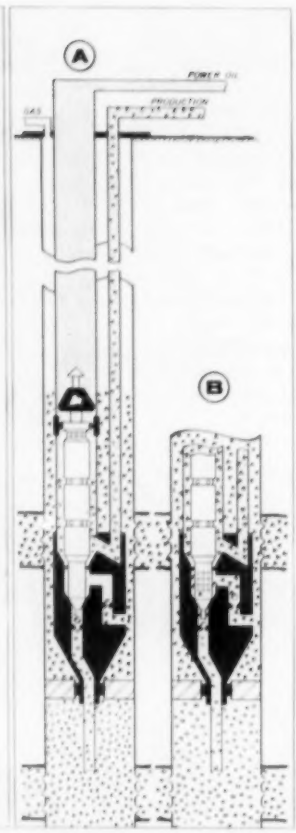

Fig. 2—Free pump installation for alternately pumping two zones.

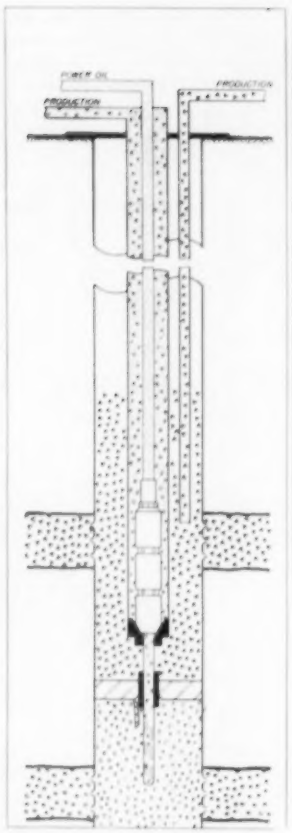

Fig. 3—Type installation for pumping the lower zone while flowing upper pay.

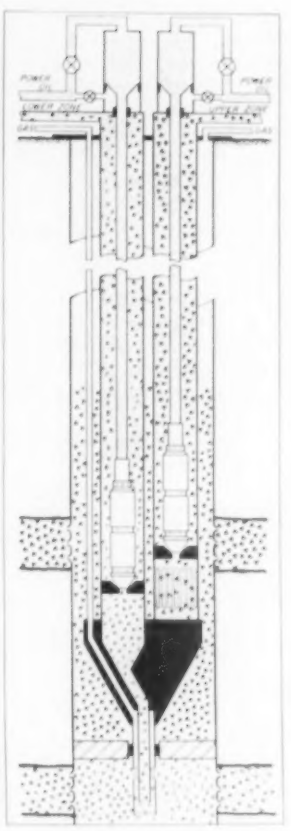

Fig. 4—Two zones independently pumped with gas relief provided for both pays.

These Six Hydraulic Pumping Systems Will

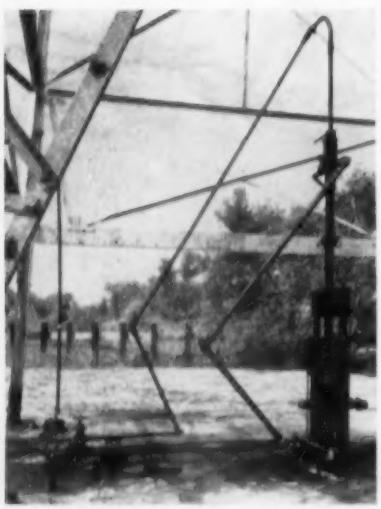

Fig. 1-A—Oldest two-zone hydraulic pumping installation is near Shawnee, Okla. This 10-year-old installation makes use of hydraulic cylinders for raising and lowering the pump intake from one zone to the other.

Lack of satisfactory equipment has retarded more general adoption of dual-zone completions. Shown are some systems designed to meet special problems

by D. H. Stormont
District Editor

HYDRAULIC pumping is receiving increased attention by operators in multipay fields because of its flexibility in coping with dual-zone production problems.

Dual-zone completions offer attractive savings by eliminating drilling costs for a second well. They have not been too popular, however. Lack of satisfactory economical methods for producing the wells after they ceased flowing has been the principal drawback.

The operator in many cases has hesitated to undertake a dual-completion development program because high well-servicing costs may more than offset savings in initial capital investment. The manufacturer, on the other hand, has hesitated to develop such equipment until he is assured of a market.

Need for equipment which will efficiently pump the two zones without commingling the oil and gas has been the principal problem. It will continue to be a major problem, one which will make for more complicated equipment than that in the single zone well. But because of the potential savings offered, operators and equipment manufacturers have been carrying on a great deal of experimentation.

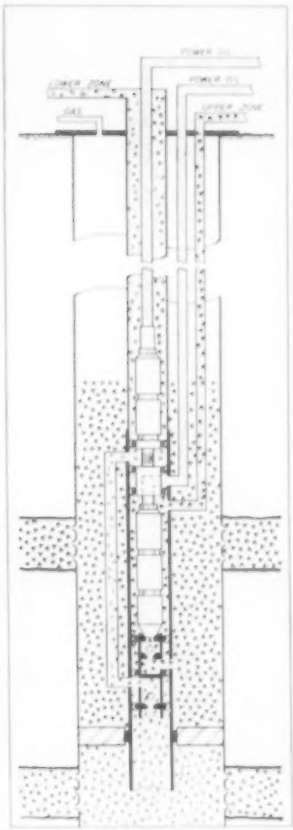

Fig. 5 — Zones independently produced by two hydraulic pumps in tandem.

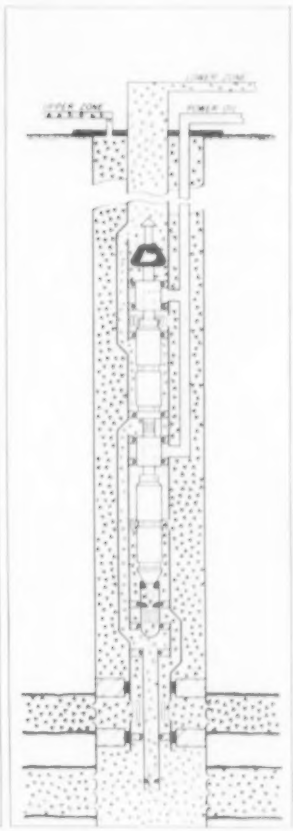

Fig. 6—Free-type pump installation for simultaneously pumping two zones.

Fig. 5-A—Bottom-hole assembly used in Fig. 5 installation.

Fig. 6-A — Surface equipment for the two-zone installation shown in Fig. 6. Regulation of pumping speeds of each free pump is effected by applying back pressure to one or the other of the two surface flow lines.

Meet Almost Any Dual-Zone Problem

Illustrative of the complex problems involved are the six types of hydraulic pumping systems shown in the accompanying diagrams. These have been developed to meet a wide variety of requirements. Each was designed to meet the special requirements of the pumping problem at hand.

Characteristics of each of the six types are given in the accompanying table. As shown, some require two pumps and some only one. The number of tubing strings in most types is two, but in one type five are required. Some make use of the Kobe "free-pump" principle. This makes it possible to circulate the bottom-hole pump, or pumps, in and out of the well, eliminating need for a pulling unit in servicing the well.

Highlights of the various types are as follows:

1. Zones pumped alternately . . . This installation, which has operated successfully for more than 10 years, involves suspension of the production tubing on a yoke between two hydraulic cylinders. Both the flow line and power oil line have swing joints which allow them to flex when the tubing is raised or lowered.

As shown in Fig. 1, the pump intake is through a stinger below the pump seat. Position of the stinger above or below the retainer production packer determines which zone is being pumped. At the surface, hydraulic cylinders actuated by power oil pressure raise or lower the stinger (see Fig. 1-A). Intake position of the pump is changed about twice a month. This particular installation is near Shawnee, Okla.

2. Zones pumped alternately, free pump used . . . In this installation, a special adapter attached to bottom of the Kobe free pump determines which

CHARACTERISTICS OF VARIOUS TYPES OF TWO-ZONE HYDRAULIC PUMPING INSTALLATIONS

Characteristic—	Type (1)	(2)	(3)	(4)	(5)	(6)
One zone pumped, other flowed			X			
Zone pumped alternately	X	X				
Both zones pumped simultaneously						X
Both zones pumped independently				X	X	
Gas relief for upper zone	X	X	X	X	X	
Gas relief for both zones				X		
Free-pump principle used		X				X
Can be converted to free pump	X		X			
Number of pumps in well	1	1	1	2	2	2
Number of tubing strings	2	2	3	5	4	2
Casing annulus used as flow channel						X
Minimum casing size used	4	5½	5½	7⅝	5½	5½

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zone is to be pumped. If the lower zone is to be produced, an open-end blank adapter is made up on the pump as shown in Fig. 2-A. This permits the lower zone to be pumped but flow from the upper zone is isolated by the blank section. When the upper zone is to be produced a closed-end perforated adapter is used as shown in Fig. 2-B.

This method makes use of parallel tubing strings, with the exhausted power oil and the well's output being produced through the 1¼-in. string. The free pump is easily circulated in or out of the well, whenever necessary, and the proper adapter added to produce the zone desired. It is a simple matter to run a bottom-hole pressure bomb in the intake of the free pump to obtain operating bottom-hole pressure reading for either zone.

3. Lower zone pumped, upper zone flowed . . . The lower zone is pumped through a retainer production packer, and the upper zone is flowed through small 1¼-in. tubing in this installation (see Fig. 3). The small flow string is clamped to the 2½-in. tubing through which lower-zone oil is produced. Three-string clamps could be used to run a third small string if it was desired to use a free-pump installation for producing the lower zone.

4. Independently pumped, gas relief for both zones . . . As shown in Fig. 4, this arrangement consists of two separate conventional hydraulic units plus a special string of tubing to provide relief of gas from beneath the production packer. Gas from the upper zone is relieved through the casing annulus. In most installations, the production strings are 2-in., the gas relief string is ¾-in., and the power oil tubing is ¾-in. Minimum size casing in which this system can be installed is 7⅝-in.

The two large strings and the ¾-in. macaroni are run simultaneously, after first attaching some 250 ft. of 2-in. tail pipe and 225 ft. of 1-in. pipe below the crossover shoe. The special shoe provides a mechanical connection for the three tubing strings, as well as the means for producing oil and gas from beneath the retainer production packer. Upper zone fluid is produced through a 6-ft. perforated sub hung below the seat for the hydraulic pump serving that zone.

Several of these systems have been installed in an area where paraffin is a problem. To control the paraffin, hydraulic lifts are used on each of the hydraulic pumps to provide a means of scraping out accumulated paraffin in the annulus between the power oil and tubing strings.

5. Zones pumped independently . . . In this installation, shown in Fig. 5, the hy-

THE PROOF IS IN THE FIELD . . .

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Long-stroke Hydraulic Pumping Units

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Carter Unit Pumping in Edna Field. Has been in service for seven years.

KANSAS

One of 4 units in the Great Bend Area, pumping from 2400 ft., owned by large independent.

EAST TEXAS

One of 5 Carter Units owned by a major oil company in Kilgore and Turnertown Areas. Pumping allowable from 2500 ft. Total cost about 80% of the cost of a conventional unit.

OKLAHOMA

One of seven units owned by an independent in the Tulsa area, pumping from about 1500 ft. Operator reports production holding up better than offsetting wells with conventional units.

KENTUCKY

Carter Unit on 15-ft. subsurface in the Green River formation. Operator saved about 30% on substructure cost alone. This is one of seven units owned by this independent.

NORTH TEXAS

Major oil company installation in Caddo Field, pumping 30 bbl/day from 6250 ft. No rod failures in more than a year's operation. Total cost about 50% of the cost of a conventional unit.

CANADA

Carter Unit operating in 50 degree-below-zero weather in the Carbondale Field, showing adaptability of Carter Unit to extreme climatic conditions.

SOUTH TEXAS

Production increased from 3½ bbl/day to 6 bbl/day on this 2760-ft. well in the Duval County Area, when it replaced conventional equipment. This is one of 11 units owned by this independent.

WEST TEXAS

Carter Unit in the Spraberry Area, pumping from 7080 ft. This unit was installed for about 30% of the cost of a conventional unit.

MORE THAN 800 UNITS NOW IN SERVICE!
MORE THAN EIGHT YEARS OF FIELD EXPERIENCE!

From Canada to the Gulf, from Ohio to the Pacific, Carter Long-Stroke Hydraulic Pumping Units are saving thousands of dollars, for majors and independents alike, through lower first cost and maintenance as well as increasing production in many cases.

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draulic pumps are run in tandem inside a single 2 or 2½-in. string of tubing. The large string, equipped with a special bottom-hole assembly, is run to bottom with two macaroni strings clamped to it. The two hydraulic pumps, joined by an adapter, are then run on a power-oil string inside the large tubing. The two production units have special O-ring seals which land in collars within the bottom-hole assembly (shown in Fig. 5-A).

This arrangement results in separate power-oil strings for each production unit, thereby permitting independent speed control. Separate return strings are provided for production from the two zones. Upper-zone gas is relieved through the casing annulus.

6. Zones pumped simultaneously, free-type pump . . . By means of the hook-up shown in Fig. 6, two zones are simultaneously produced through the use of only two strings of tubing. A 2 or 2½-in. string handles the lower zone's production while that from the upper is produced through the 5½-in. casing annulus. Power oil input to both free pumps is through a macaroni string. The upper zone is isolated by production retainer packers above and below the zone.

The two free pumps are rigidly joined and the packer nose attached to the assembly. Special O-ring seals and collars in the bottom-hole assembly allow input oil to be ported to the engine end of each free pump. The topmost pump handled production from the lower zone and the bottom pump handles the upper zone.

Upper-zone crude only is used as power oil. It does not mix with lower-zone production. Power oil from both pumps exhausts through the lower unit where it mixes with upper-zone production and is produced through the casing annulus.

The rate of power-oil input controls the sum of the stroke rates of both pumps. Individual pump speeds are regulated by applying back pressure to one or the other of the two surface flow lines (Fig. 6-A). This system is performing very satisfactorily at more than 60 Gulf Coast wells in which it has been installed.

BOOK

OIL AND PETROLEUM YEAR BOOK—1955. Compiled by Walter E. Skinner. Published by Walter E. Skinner, 20 Copthall Avenue, London, E.C.2, England. 700 pp. $5 post free abroad.

This standard reference book of world oil companies contains complete and up-to-date particulars of 970 British, American, Canadian, and foreign companies operating in all branches of the oil industry. The book contains a buyer's guide of manufacturers of oilfield and refinery equipment listed under 883 headings.

Save That Pumping Power!

Motor-switched capacitors on your electrified beam-pumping units can save you money. Data from operating leases show that motor-switched capacitors will pay for themselves in less than a year. They do this by increasing line voltage, decreasing power consumption, relieving transformer load, and decreasing maintenance cost of motors.

by Roger K. Owen

FIRST, let's review the heart of the problem—the reactive current demanded by the peculiar cyclic load of the beam pumper. Fig. 1 shows an oscillogram of the current in a 10-hp. motor, both with and without a capacitor connected. Note that it is the light-load current that is most reduced by the capacitor, since this light-load current is essentially purely inductive.

Fig. 2 shows the relative magnitude of currents at the typical power factors before and after the use of capacitors. The leases studied are in the Panhandle area and in the plains of South Texas.

Capacitor Economics

The economics of capacitors involve these three major factors:

- Reduced I^2R losses (system losses in kw.-hr.).
- Improved operating conditions (voltage stability, better starting torque, less maintenance).
- Savings in transformer and line capacity. (More kva. available).

It is the above three factors which we now evaluate in terms of dollars. The data is actually measured. It represents actual money saved on the leases studied.

There is not enough data available yet to define very well the effect of motor-switched capacitors on maintenance costs. There should be no theoretical effect at all, but in practice a great many voltage conditions are bad enough so that proper-size heater strips or fuses cannot be used, with obvious results.

Author is with Southwestern Public Service Co., Borger, Tex.

There seems to be some voltage-surge protection by capacitors, also. One company installed capacitors and the percentage of their motors that had to be removed for repair per year changed from about 30 to about 3 per cent. The company believes that most of the improvement was due to fewer thunderstorms, but some of it is almost certainly due to better operating conditions of voltage.

Repair incidence for adjacent leases for other companies stayed around 10 per cent for these years. The figure for lowered costs due to capacitors has been conservatively set at 3 per cent for this study, in order to recognize the factor as one to be considered.

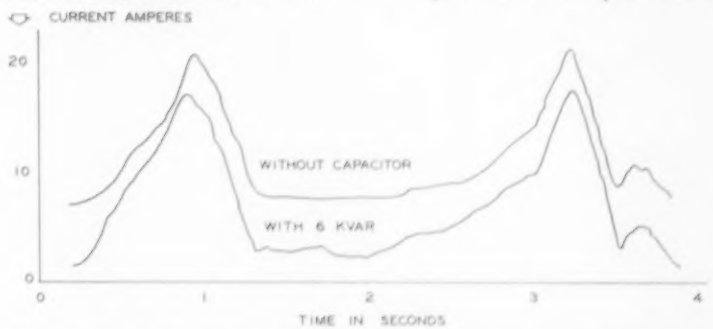
The following table shows representative results of actual capacitor installation:

Lease	1 Per cent voltage increase	2 Per cent kw.-hr. decrease	3 Per cent bank capacity released	4 No. wells and size in hp.	5 Bank size in kva.	6 Cost capacitors in dollars	7 Dollars saved per year for less kw.-hr.	8 Bank capacity saved value in dollars	9 Maintenance cost saved 3 per cent per year	10 Total saving first year in dollars	11 Per cent of capacitor cost saved by less kw.-hr.
A	7.5	9.3	56	9-7.5	45	337	130	425	30	585	39
B	4.5	3.5	45	7-7.5	27	70	63	204	24	291	90
C	11	14	94	13-7.5	45	650	325	730	44	1,099	50
D	6	4	43	9-10	75	450	120	544	41	705	27
E	6.6	10.4	53	2-10 10-7.5	75	462	374	680	43	1,097	81

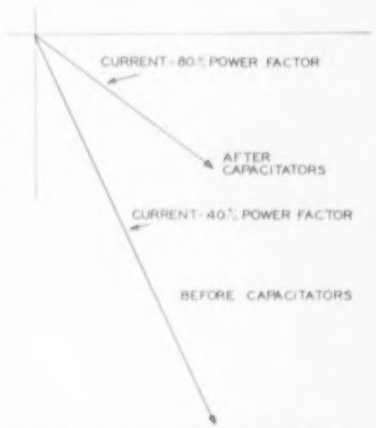
Here are explanations of the column headings in the table:

Column 1—Per cent voltage increase at pump the longest distance from the station after capacitors were installed.

Column 2—Per cent kw.-hr. decrease on lease when capacitors were added. The figure includes improvement in

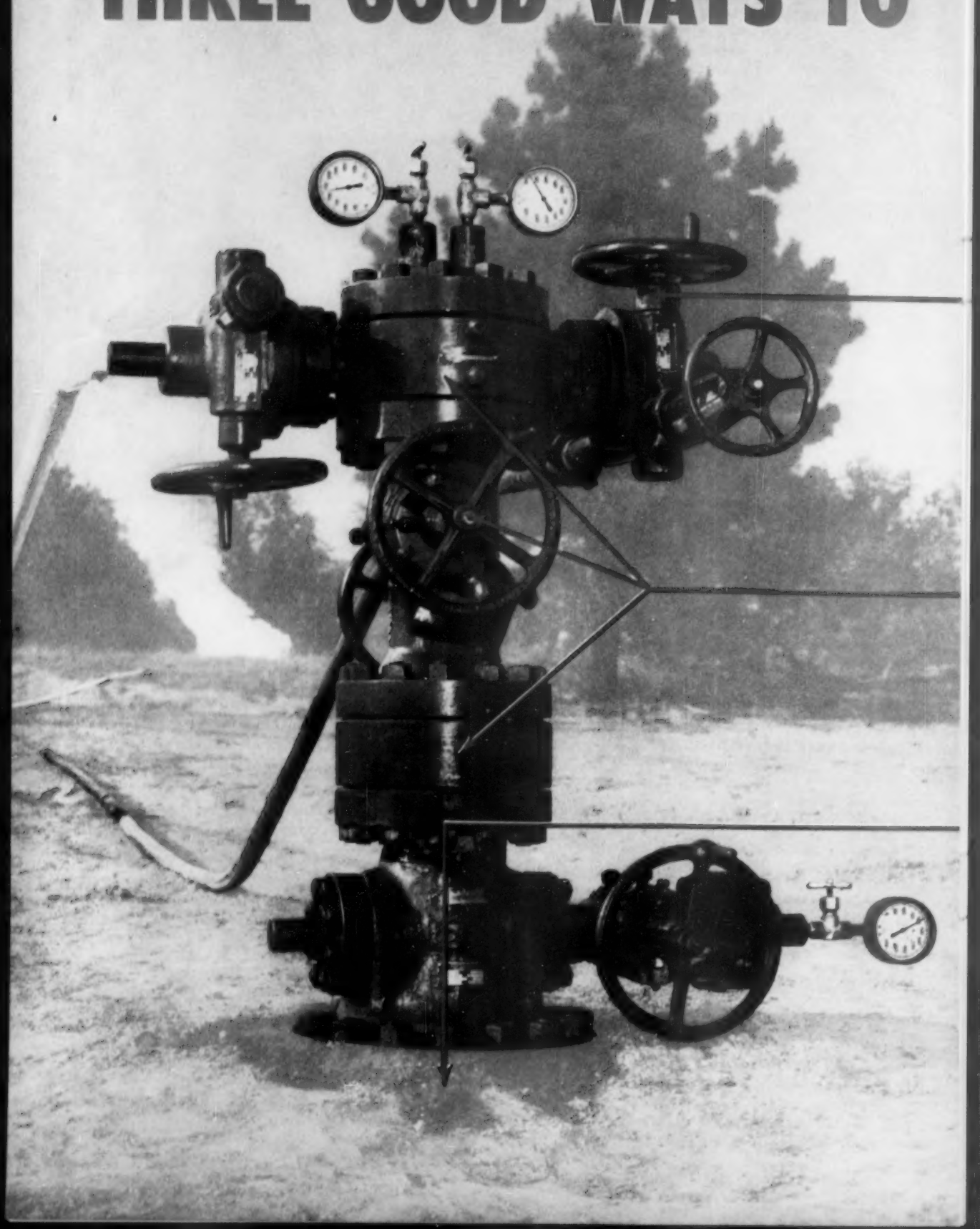


CURRENT IS REDUCED throughout the beam pumping cycle when capacitors are operating. This not only reduces power cost but also improves lease operating conditions. Fig. 1.



Capacitors reduce current needed for lease pumps by decreasing inductance and increasing power factor. Fig. 2.

THREE GOOD WAYS TO



KEEP WELL COSTS DOWN

Here are three outstanding cases where quality and economy do mix. O-C-T—a recognized industry leader in wellhead quality and service—also offers these three products to help operators reduce well costs.

1

O-C-T TYPE "JE" FLOW CONTROLS

With the "JE," one unit takes the place of the four that go to make up a conventional flow wing. First cost is reduced by as much as 90%. Weight is cut up to 70%. Valve repair costs are cut to a minimum. The "JE" Flow Control is a money-saver for use on nearly all Christmas Trees, regardless of size or type. Be sure to order a "JE" as a part of your next Christmas Tree.

2

O-C-T DUAL COMPLETION CHRISTMAS TREES

With this assembly, one well can do the work of two. Two zones can be produced with equal efficiency. Each can be serviced independently. O-C-T assemblies are true O-C-T all the way through in quality, safety, and economy. Be sure to specify O-C-T on your next dual completion.

3

O-C-T TUBING AND CASING HEADS

The O-C-T Type T-20 Tubing Head features the quality of the T-16 without costly lockdown screws which are not needed with the O-C-T Dual Completion Trees. The O-C-T Type C-20 Casing Head saves rig time and simplifies the setting of casing under full blowout preventer control. On medium depth wells, it gives all the adantages of the C-19 at a lower first cost. Ask your O-C-T Representative for full information.

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motor efficiency, line I^2R losses, and in most cases, station efficiency.

Column 3—Per cent transformer-bank capacity released, in kva. Many banks were overloaded without capacitors.

Column 4—Number and size of pumping wells on leases. Virtually all are high-torque, normal slip.

Column 5—Installed bank capacity in kva.

Column 6—Cost of installed capacitors, at $12.50 per reactive kva. Lease B had only five of seven motors with capacitors.

Column 7—Annual dollar saving on kw.-hr. purchased to pump the lease. Base cost used is 1.3 cents per kw.-hr.

Column 8—Actual dollars cost available in bank capacity. Practically all operators can utilize these extra kva., even on existing leases, by changing banks to fit lease demand or by removing one transformer and operating open delta. Base cost used is $17 per kva.

Column 9—Money saved in annual maintenance costs due to better operating conditions. Rewind cost is entered at $15 per horsepower, and 3 per cent less repair per year on the motors on the lease is used.

Column 10—Total dollars saved from Columns 8, 9, and 10.

Column 11—Column 7 compared to Column 6—annual payout on I^2R losses only.

What this means . . . Because power factors seem to be about 35 to 50 per cent in these areas, and because this power factor is worse than many operators have believed, it may pay us to take a closer look at the value of using capacitors on existing leases. Every new lease should use them because it should pay in every case. I^2R losses alone justify capacitors in many cases.

Other advantages that are not evaluated here include better starting torque and some lightning protection. The only caution seems to be educating operators to let disconnected capacitors discharge before considering as deenergized.

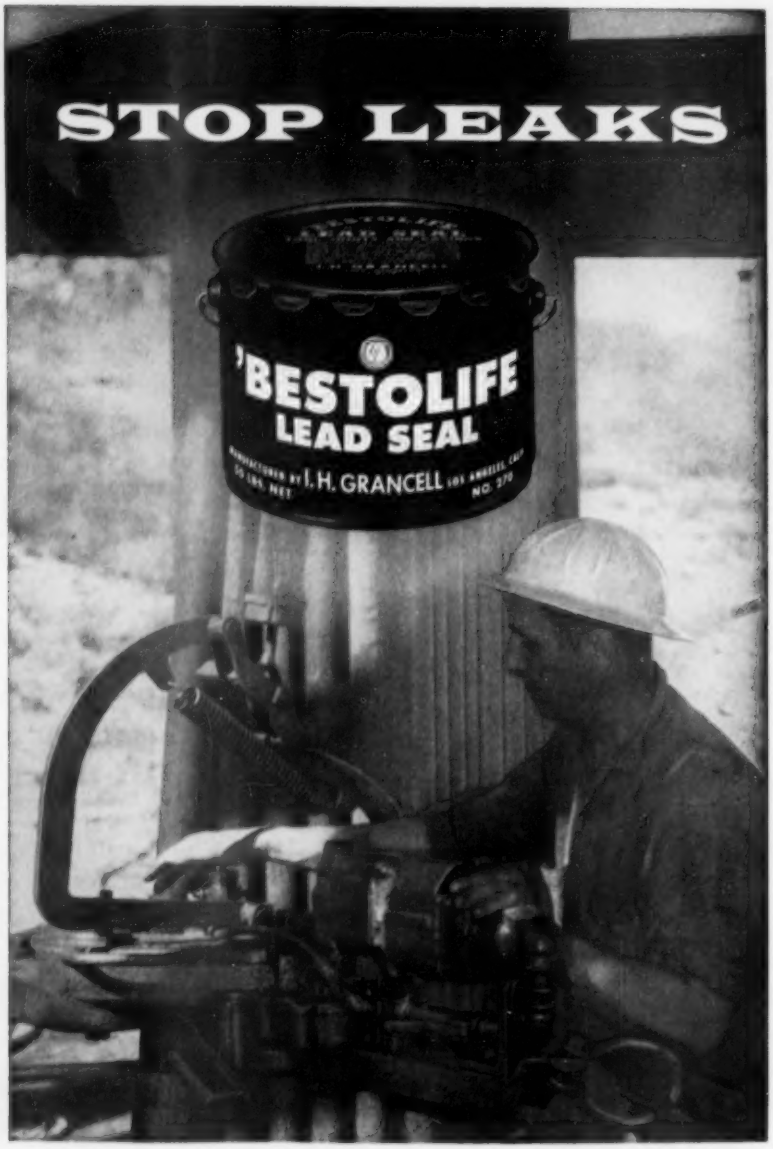
It is easy to check the power factor on any lease by clocking the meter-disk rotation, first with one potential coil deenergized, then with both energized. It would pay the operator to check his lease-power factors and to try capacitors on existing leases. Capacitors pay for themselves even on most leases already electrified.

References

1. Power-Distribution Systems for Oil-Field Pumping Service, Bloomquist & Poore, General Electric.

2. Application of Capacitors in Oil-Field Production, Helms & Horrigan, 1948.

3. Electrified Oil Well Pumping, Westinghouse pamphlet, 1950.



It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

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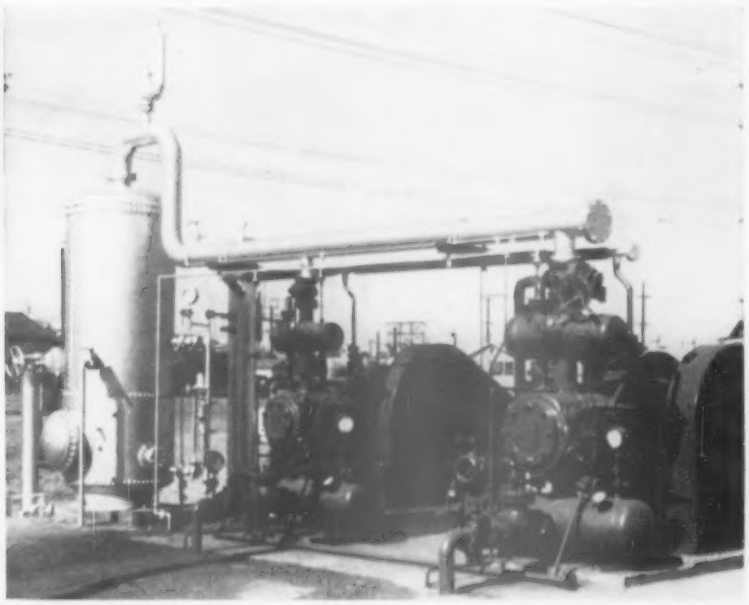
NO VAPORS ESCAPE at this loading rack. They are recovered via the hood and suction line.



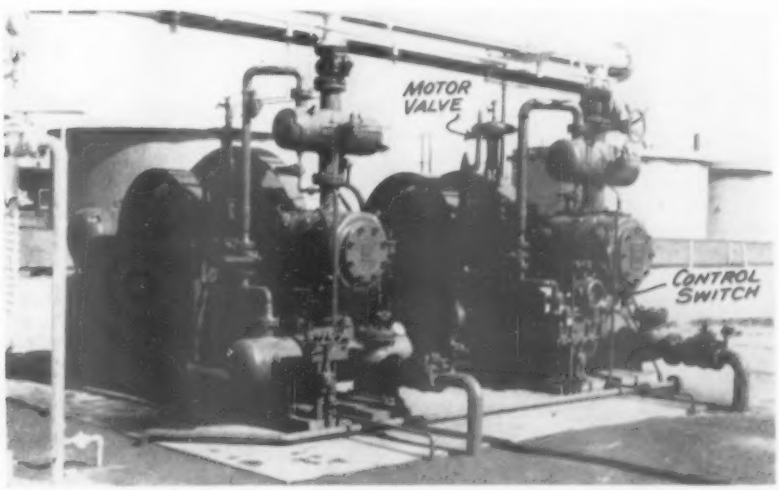
ENTIRELY AUTOMATIC, these motor-driven compressors at the loading racks operate in accordance with the vapor load released during loading.

The automatic compressor setup was especially designed for . . .

Recovering gasoline vapors during loading

by D. H. Stormont
District Editor

NEED for the recovery of gasoline vapors normally lost to the atmosphere during tank-truck loading operations has resulted in General Petroleum Corp. engineers designing fully automatic compressor installations at its Torrance refinery and Vernon bulk terminal.



MOTOR VALVE—A normally open pneumatic-diaphragm valve is installed in bypass between the suction and discharge bottle on each cylinder. In starting, this control valve is closed by means of solenoid and time-delay switch.

The automatic motor-driven compressors are unique in that no manual labor is required in starting and stopping the compressors. The load is entirely controlled by pressure, or vacuum, in the suction and intake manifolds.

The vapor-recovery equipment was added in order to reduce contributions to the Los Angeles area's smog problem. Volumes resulting from refinery and bulk-station loading activities are of minor importance when compared with those daily emitted by automobiles—some 20 tons as compared with an estimated 1,200 to 1,500 tons. But air-pollution-control authorities are asking that all loading racks be equipped for vapor recovery.

Equipment for collecting vapors from the tank manholes, which are filled at rates of about 500 gal. per minute, consists of a suction line and a hood which encloses the loading line. The hood is made of lucite which allows loading

...One

BAKER

RETAINER PRODUCTION PACKER

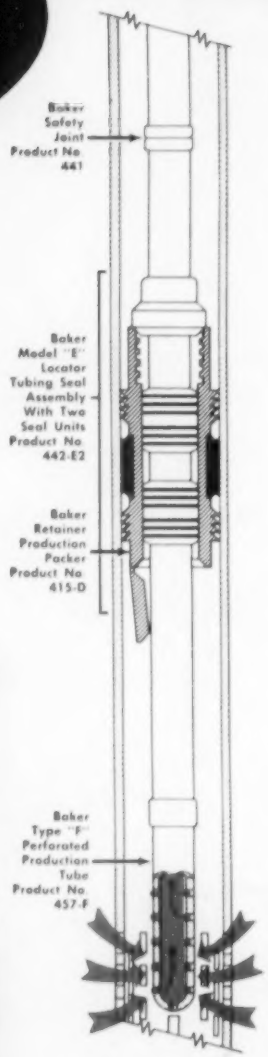
PRODUCT NO. 415-D

SINGLE ZONE

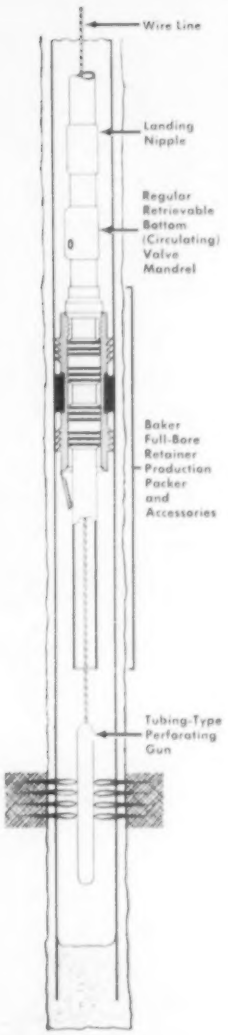
PERMANENT-TYPE WELL COMPLETIONS

The Baker Retainer Production Packer has been used in nearly every production application, old or new, and promises to play an even greater role in future production applications.

Because it can also be used successfully as a squeeze tool, it is used in a variety of supplemental applications (such as testing, acidizing, formation fracturing, squeeze cementing, etc.) that might be required during the completion or work-over phase of a well. That is why the Baker Retainer Production Packer has been frequently referred to as the "universal" packer, because it is truly the *one* packer that can be used *for all* production and many supplemental applications.


Baker Safety Joint Product No. 441
Baker Model "E" Locator Tubing Seal Assembly With Two Seal Units Product No. 442-E2
Baker Retainer Production Packer Product No. 415-D
Baker Type "F" Perforated Production Tube Product No. 457-F

Illustrates Packer set in casing with Locator Tubing Seal Assembly and Production Tube installed for single zone production.


Wire Line
Landing Nipple
Regular Retrievable Bottom (Circulating) Valve Mandrel
Baker Full-Bore Retainer Production Packer and Accessories
Tubing-Type Perforating Gun

Illustrates typical Permanent-Type Well Completion Hook-Up showing perforating operation through and below the Packer.

FEATURES

Can be run and set with the speed and accuracy of wire line, as well as on tubing or drill pipe.

Holds any pressure from either above or below that is safe for the casing, even under temperatures in excess of 300°F.

Pack-off is independent of set-down weight or tension. Tubing string is free; just pick up (or unlatch and pick up) to remove it.

When tubing is removed, flapper valve closes to isolate zone below packer.

Baker Locator Tubing Seal Assembly Product No. 442-E2

Baker Retainer Production Packer Product No. 415-D

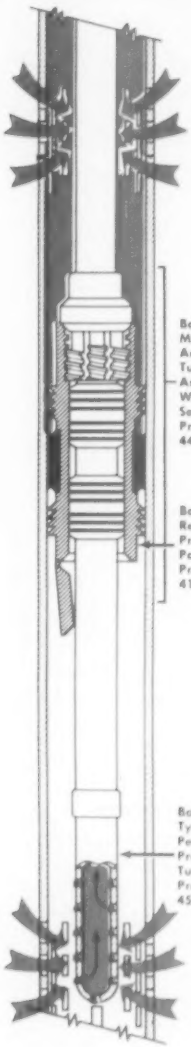
Successfully holds high pressures from above or below

... at shallow or record depths
even under temperatures in excess of 300°F.

for all

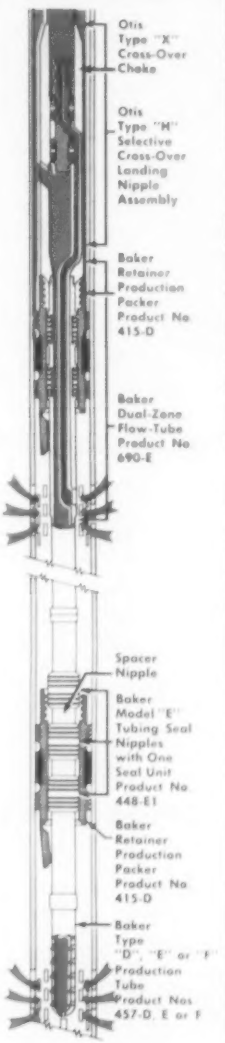
DUAL ZONE

SINGLE PACKER


Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Retainer Production Packer Product No. 415-D
Baker Type "F" Perforated Production Tube Product No. 457-F

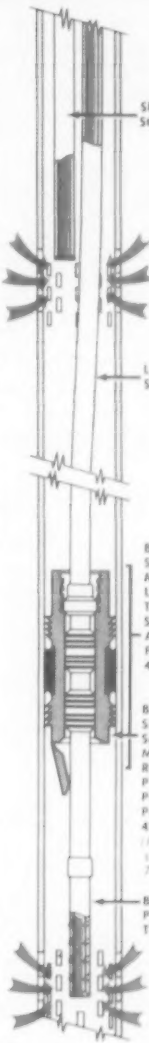
Illustrates Packer set in casing, with anchored production string for dual zone production. Tubing can be released from packer by rotating to right.

SELECTIVE CROSS-OVER


Otis Type "X" Cross-Over Choke
Otis Type "H" Selective Cross-Over Landing Nipple Assembly
Baker Retainer Production Packer Product No. 415-D
Baker Dual-Zone Flow-Tube Product No. 690-E
Spacer Nipple
Baker Model "E" Tubing Seal Nipples with One Seal Unit Product No. 448-E1
Baker Retainer Production Packer Product No. 415-D
Baker Type "D", "E" or "F" Production Tube Product Nos. 457-D, E or F

Illustrates selective two packer dual zone production hook-up (Baker-Otis) with Cross-over Choke installed. Flow pattern can be switched with Parallel Flow Choke.

PARALLEL STRING


Short String
Long String
Baker Size 100 Model "E" Locator Tubing Seal Assembly Product No. 442-E2
Baker Size 100 Series Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

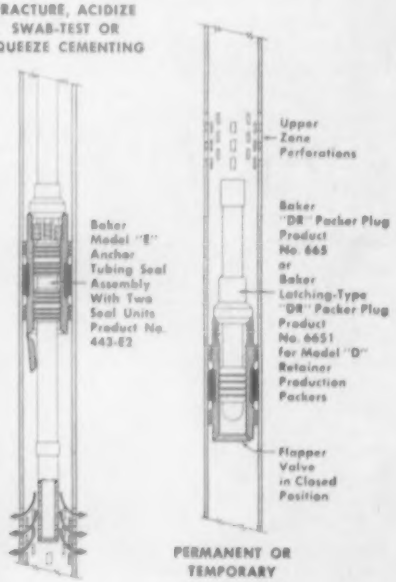
Illustrates simplest type of parallel string installation. Other installations involving two packers with full-opening tubing running through and below lower packer available.

SUPPLEMENTAL APPLICATIONS

WATER OR GAS INJECTION

The Baker Retainer Production Packer contains features that permit it to be used as a squeeze or testing tool as well as a temporary or permanent bridge plug. It is thus used in a variety of supplemental applications such as gas or water injection, testing, fracturing, acidizing, etc., that may be required either during the completion phase of a well or during a later phase.

FRACTURE, ACIDIZE SWAB-TEST OR SQUEEZE CEMENTING


Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Upper Zone Perforations
Baker "DR" Packer Plug Product No. 665 or Baker Latching-Type "DR" Packer Plug Product No. 6651 for Model "D" Retainer Production Packers
Flapper Valve in Closed Position

PERMANENT OR TEMPORARY BRIDGE PLUG

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to be watched, and the compartment topped off with the vapor-recovery equipment in place. It is adjustable up and down the 3-in. fill line.

At the bottom of the hood, a 30° tapered plug covered with neoprene hycar rubber fits into the manhole. An air-operated piston lowers the loading arm and keeps the plug firmly in place in the manhole, as is shown in the accompanying photograph. Flashed vapors in the hood pass through a 2½-in. quick-opening valve to a vapor header. This in turn is connected through a pressure controller to the suction of the compressors. The 2½-in. valve was linked to the gasoline filling valve so as to open and close simultaneously.

Due to the possibility of air content entering the system in sufficient amounts to cause an explosive mixture, the Vernon and Torrance installations use a dry-gas purge system. The dry gas is connected into the end of the vapor header at each loading rack through a regulating valve controlled by means of a pressure controller. When the vapor header pressure falls below atmospheric pressures, dry gas is taken into the system.

During normal filling operation, the vapor header is controlled at around 2-in. water pressure by means of a pilot-controlled motor valve. An inverter installed in the pilot-air piping prevents pulsation. At Vernon, approximately 2 M.c.f.d. of dry gas is used for purging. Spot analysis of the vapor stream has not shown a hydrocarbon content less than 20 per cent.

Installations . . . Two motor-driven compressors were installed at each location. One has a 200-cu. ft. per minute capacity and the other has a capacity of 450 to 500 cu. ft. per minute. Each compressor is equipped with compressor-cylinder pulsation bottles, piston-type check valves, pulsation discharge choke tubes, and a normally open motor valve in a bypass line between the suction and discharge bottle on each cylinder.

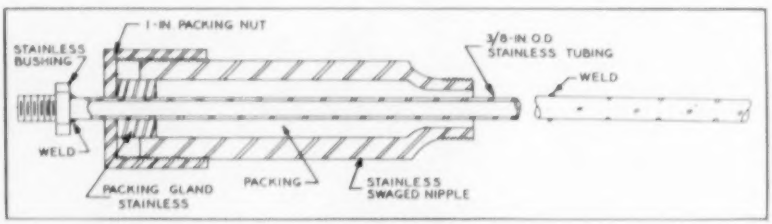
The cylinders are equipped with pilot-operated unloaders. Compressor cylinders are cooled with a thermosiphon system using absorption oil as the cooling medium.

In starting the compressor, the normally open diaphragm motor valve is closed by means of an electric solenoid valve and a time delay switch. This time delay is set to close 15 seconds after the starting circuit is closed, enabling the unit to come up to full speed before compression starts.

A meletron vacuum pressure switch set at 2-in. (Hg) vacuum is installed in the circuit to the larger compressor. The intake pressure thus has to be pulled down to 2 in. of vacuum before the larger compressor can start up. Unloaders on the small compressor are set to close at 6 and 7-in. vacuum and open at 9 and 10 in., respectively.

The large compressor has also installed in the motor circuit a Mercoid double-magnetic switch which starts the compressor when the vacuum falls to 2½ to 4-in. vacuum. It opens at 8-in. vacuum. One unloader is set to close at 3-in. vacuum and open at 6-in. vacuum. The other is set to close at 4-in. and open at 7-in. vacuum, respectively.

At Vernon, the collected vapors are compressed to approximately 6 psig. and burned as fuel under steam boilers. At Torrance they are compressed to 50 psig. and fed into the refinery fuel system. Sufficient compressor capacity was installed to cover all present and future conditions of filling.



For easier cleaning of liquid-level gages

CLEANING of liquid-level gages in place can be facilitated by using a cleaner made of small-diameter tubing. This is perforated with a number of small holes at one end and equipped with a bushing at the other end to which a bore may be connected if it appears desirable to do so.

A stuffing box is provided, consisting of a swaged nipple, a packing gland, and a nut. The tubing is inserted into the gage glass with the stuffing box threaded to the lower gage-glass valve. A steam or water hose is connected to the bushing. The steam or water is turned on and the tubing is moved up or down through the stuffing box and column until each gage-glass section is cleaned.

This method was suggested by Loyd C. Walker, pipefitter, Humble Oil & Refining Co., Baytown, Tex.

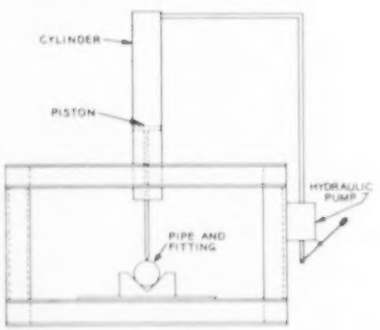
How to build a salvage press from scrap

A SALVAGE press for use in reclaiming pipe and fittings may be easily constructed from materials and equipment normally available in most maintenance shops.

A box frame is first built from sections of steel beam. Then a hand-operated ram is mounted on the frame. The hydraulic pump should be attached to the outside of the frame, with the cylinder supported in the center of the frame.

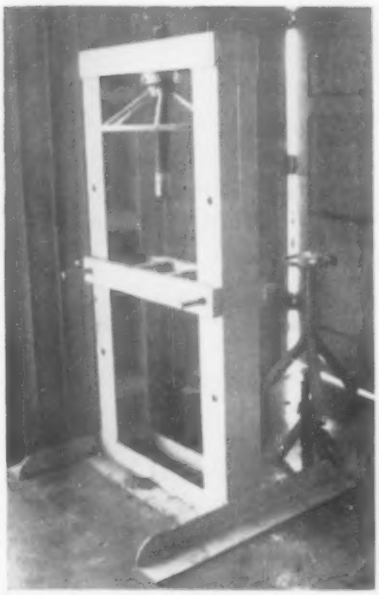
A notched steel block capable of accommodating the various sizes of pipe and fittings to be handled should then be secured below the cylinder.

In using the press, the pipe (or fitting to be broken) should be placed in the notch, and then the hydraulic pump should be operated to exert a pressure on the pipe (or fitting). With the piece being worked on being thus firmly held, a wrench may then be used on the other end to break the thread.



This provides a safe, quick means of salvaging fittings and pipe. Previously, it was necessary to cut off the pipe end and then remove the fitting with a sledge or chisel. Courtesy Sinclair Refining Co., Houston, Tex.

ON THE JOB . . . IN THE PLANTS



How Sunray men built this press from scrap

A SHOP accessory capable of exerting a substantial downward force has been constructed from scrap material at Sunray Oil Corp.'s Benton, La., gasoline plant.

The main portion of the unit consists of a rectangular frame. This is made up of angle irons welded together so that the vertical and horizontal members are, in effect, U-beams. Nipples are welded at appropriate places on the interior of the U-beams to provide structural strength.

The frame is supported vertically on a short end, and has angle-iron floor members welded on the bottom edge to provide stability.

A threaded shaft extends downward through a bearing-mounted wheel in the upper member of the unit. Then, as the wheel is revolved, the shaft will move in a vertical direction.

A center cross member is also included. It is made up of heavy bar steel and serves to support the equipment being worked on. This center member is supported at either end by a pin which extends through holes drilled in the U-beams. Three pair of holes are drilled at varying heights so the cross member may be raised or lowered to accommodate different sizes of equipment.

In operating the unit, the equipment being worked on is supported on the crossmember and the wheel is turned to bring the shaft downward into position. An appropriately sized pin or block is then inserted between the equipment and shaft so that as the wheel continues to be turned, the shaft makes up against the pin or block and exerts a downward force.

This spray washer cleans test and viscosity glassware

SPRAY washing equipment can be easily constructed to clean pour test and viscosity glassware.

The equipment consists of a 5-gal. reservoir tank located conveniently below a sink, and a pump which obtained suction from the reservoir.

Solvent is pumped up through a spray into the sink where it can come in contact with soiled glassware. Solvent returns through a runoff line to the reservoir tank, from where it is recirculated. Provision is made for the tank to be drained to the sewer when necessary.

This has the following advantages: (1) saves considerable time over hand-washing of equipment; (2) since solvent reservoir is not exposed, it eliminates any hazardous fumes; and (3) solvent requirements are reduced by this method.

Method suggested by Marcus H. Shelton, tester; courtesy Humble Oil & Refining Co., Baytown, Tex.

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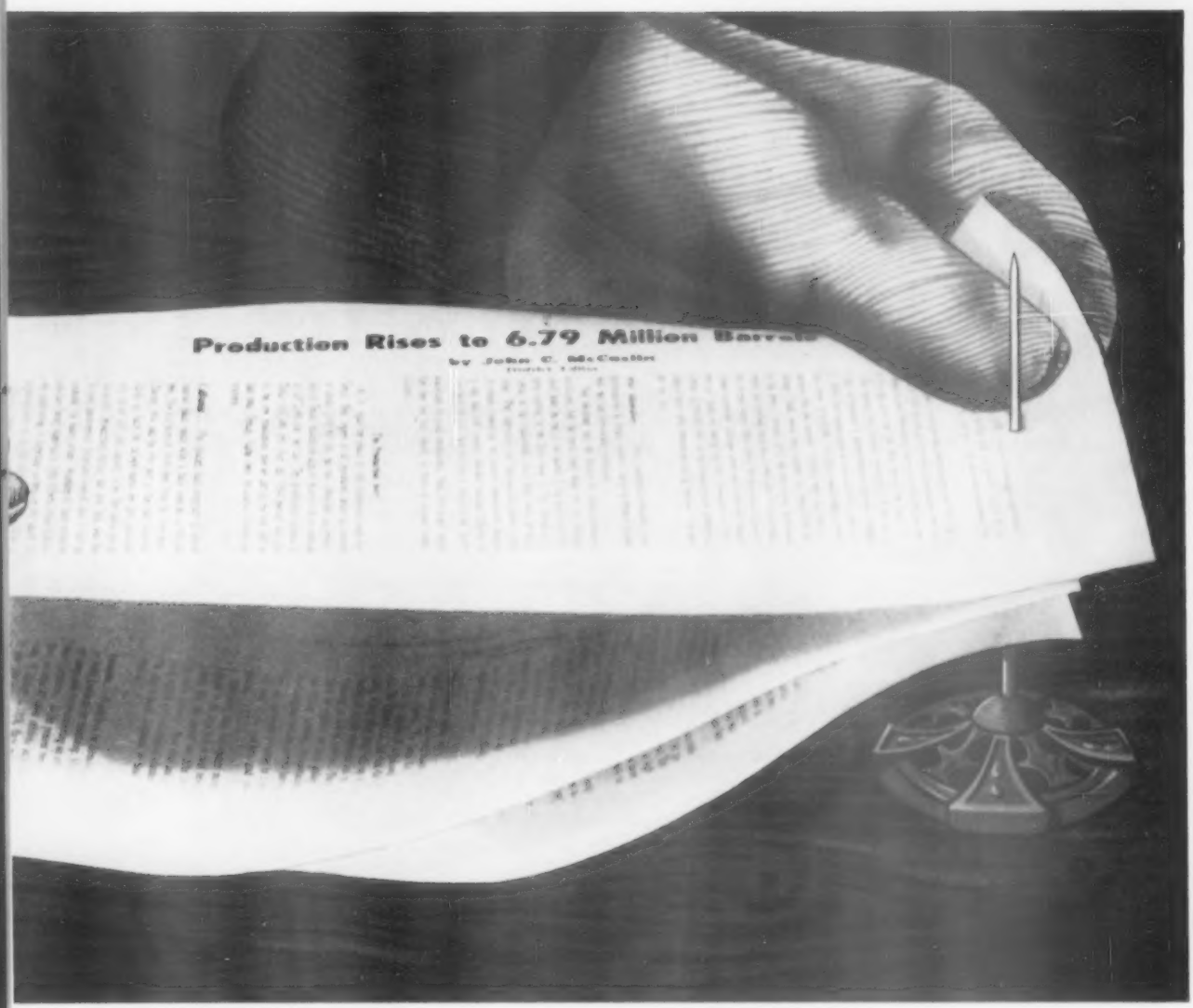

OIL INDUSTRY

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by Ovid Baker
and
Will Swerdloff

EQUIPMENT DESIGN AND OPERATION

CALCULATION OF SURFACE TENSION—2

How Temperature Variations Alter Surface Tension

THE work of creating new surface against the resistance of the surface tension is not large in magnitude. For example, if 20 g.p.m. of water is pumped through a spray nozzle for 1 day, about 28,800,000 sq. ft. of new surface will be produced with a pressure drop of 250 psi. across the nozzles. The hydraulic horsepower required is 2.92, which will amount to 70 hp.-hr. per day.

The surface tension of water is 76 dynes per cm. and 76 ergs are required for each square centimeter of new surface formed. The horsepower-hours used in 1 day's operation of the sprays is the product of (76) (3.4607 × 10^{-11}) (28,800,000) = 0.076 hp.-hr. Only 0.1 per cent of the work done is due to surface tension.

A 20-plate bubble-tray absorber removing hydrogen sulfide from 35 M.M.c.f.d. of gas at 150 psi. would form about 106 million square feet of new surface in the form of bubbles each day. The surface-tension work to create this amount of new surface requires 0.22 hp. This horsepower is only 2.5 per cent of that required to overcome the frictional resistance of the gas passing through the caps and risers.

Approximate surface-tension values for some common liquids are given in Table 1. Although these values will indicate the variations in surface tension, more exact values should be used in calculations. References 1, 2, 3, and 4* list the surface tension of many liquids. Others may be calculated by methods to be described.

Effect of temperature . . . Surface tension is affected by the temperature, pressure, and composition of the liquid and the vapor above it. The pressure simply effects changes in composition and density. Small amounts of contaminants such as dust particles may reduce its value greatly. Surface tension is decreased by increasing temperature, becoming zero at the critical temperature. For pure compounds the following equation, proposed by J. D. Van der Waals, may be used to correct surface tensions for temperature:

$$\gamma_2 = \gamma_1 [(T_c - T_2)/(T_c - T_1)]^{1.2}$$

γ = surface tension, dynes per cm.

T = absolute temperature, 460 + °F.

T_c = absolute critical temperature, 460 + °F.

This equation is more accurate than the Eotvos equation which is often used for temperature corrections.[12] For hydrocarbons, the effect of temperature is shown in Fig. 1.

TABLE 1
Surface Tension of Some Common Liquids Against Vapor at Normal Temperatures

	Dynes per cm.
Ethane	1
Propane	7
Natural gasoline, 16-lb. R.v.p.	17
Liquid chlorine	18
Crude oil, 36° A.P.I. and atmospheric pressure	21
Crude oil containing dissolved gas at 2,700 psia.	1
Crude oil, 11° A.P.I. and atmospheric pressure	41
200 molecular-weight oil	27
Methyl alcohol	23
Acetone	24
Carbon tetrachloride	27
Acetic acid	28
Phenol	41
Triethylene glycol	45
Sulfuric acid, concentrated	55
Glycerin	63
Water	76
20 weight per cent sodium chloride solution	82
20 weight per cent caustic soda solution	86
0.1 weight per cent synthetic detergent in water	30
Mercury	487

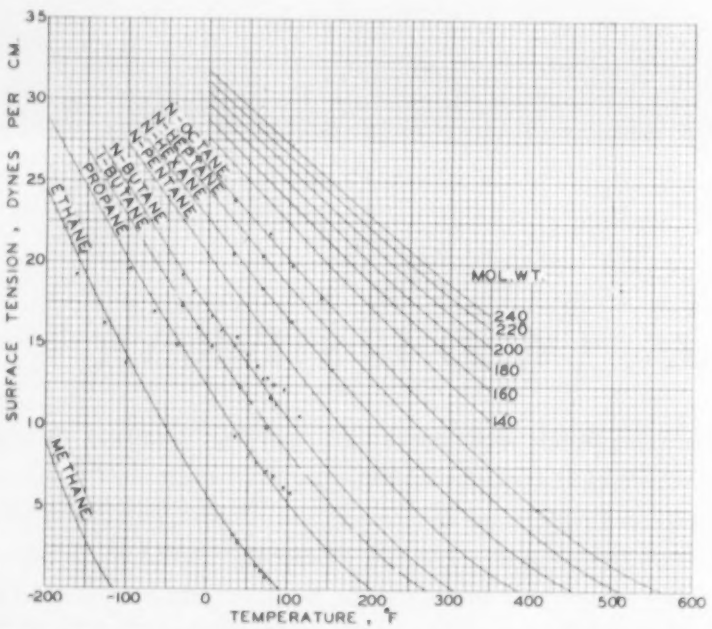

FIG. 1—The effect of temperature on the surface tension of paraffin hydrocarbons. (Source: Katz and Saltman, Ind. & Eng. Chem., Vol. 31, p. 91, 1939.)

Authors are with natural-gas department, Magnolia Petroleum Co., Box 900, Dallas 21.

*All references noted here were listed in Installment 1, which appeared in The Oil and Gas Journal, November 21, 1955, page 259.

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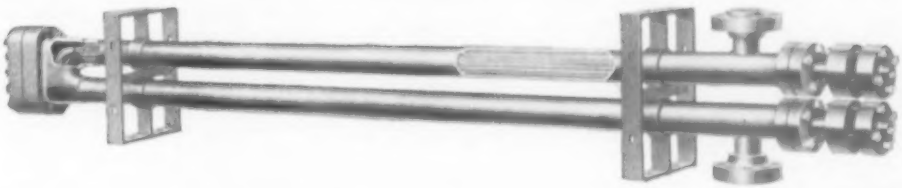
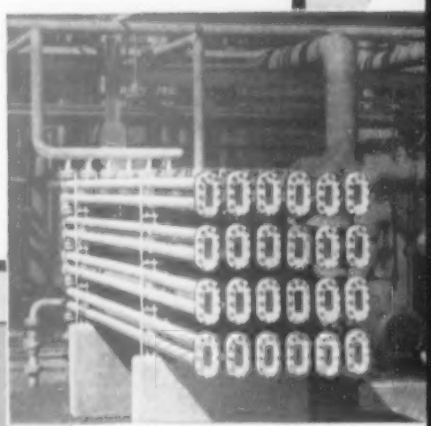


Eliminate Obsolescence and Waste in . . .



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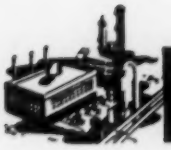

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—32

How Viscosity Affects Rotary Pump Selection

ALTHOUGH it is the maximum viscosity and the expected suction lift that determines the size of the pump and sets the speed, it is the minimum viscosity that determines capacity. Rotary pumps must always be selected to give the specified capacity when handling the expected minimum viscosity. That's because this is the point at which maximum slip, hence minimum capacity, occurs.

If this rule is not followed, the pump will not meet the requirements of the system unless (1) a considerable margin has been allowed initially in specifying capacity, or there is overcapacity available in the pump. The latter is often the case. Practically all rotary pumps are made in certain stock sizes and it is standard practice to apply the next larger pump when a capacity is specified that falls between sizes.

Q. Why does minimum viscosity influence the model of pump to be selected?

A. Minimum viscosity often sets the model of the pump selected because it is standard policy on the part of most manufacturers to downrate their pumps, insofar as allowable pressure is concerned, when handling liquids having a viscosity of less than 100 S.U.s.

This is done for two reasons First, to avoid the poorer volumetric efficiency as a result of increased slip under these conditions. And second, because a film of the liquid must be maintained between the closely fitted parts. This film is likely to break down if a combination of low viscosity and high pressure should occur.

Q. What's another important factor to consider in selecting a pump model?

A. It's the possibility of entrained air or gas in the fluid to be pumped. This is particularly likely in installations where recirculation occurs and the fluid is exposed to air—either through mechanical agitation, leaks, or improperly located drain lines.

Likewise, most fluids will also dissolve air or gas and retain it in solution. The amount retained depends on the liquid itself and the pressure to which it is subjected. It is known, for instance, that lubricating oils under conditions of atmospheric temperature and pressure will dissolve up to 10 per cent air by volume. Under the same conditions, gasoline will dissolve up to 20 per cent.

When pressures below atmospheric exist at the pump inlet, dissolved air will come out of solution. Both this and entrained air will expand in proportion to the prevailing absolute pressure. This expanded air will then take up a proportionate part of the pump displacement volume, with a consequent reduction in delivered capacity.

Obviously then, if a pump will be called upon to handle fluids containing entrained air, this fact and the percentage of such air should be included in any specifications written.

Q. What's one indication that a pump is handling fluids that contain entrained air or gas?

A. Noisy pump operation. When such a condition occurs, it is usually dismissed as cavitation. Noisy operation is inefficient operation and steps should be taken to make corrections until the objectionable conditions are overcome.

It's true, of course, that some types of pumps are more critical to the handling of air than others. This is usually due to the high inlet losses which are characteristic of these types. Proper design and speed selection will greatly help overcome this problem.

Q. How does agitation affect the viscosity of various liquids?

A. The viscosity of most liquids, such as water and mineral oil, are unaffected by agitation as long as the temperature remains constant. They are "true" or "Newtonian" fluids.

Another class of liquids—such as cellulose compounds, glues, greases, paints, starches, etc.—decrease in viscosity as agitation is increased at constant temperature. These are known as "thixotropic."

A third group, known as "dilitant," are liquids that increase in viscosity as agitation is increased at constant temperature. Such liquids are clay slurries, candy compounds, and the like.

Q. What happens if this viscosity variation is ignored in pump selection?

A. If a liquid is known to be thixotropic or dilitant, the expected viscosity under actual pumping conditions should be determined. Here's an example of what could happen if this is not determined:

In a known case concerning the handling of a cellulose product, the viscosity was given as 20,000 S.U.s. This was its actual static, or apparent, viscosity. But it later developed that under actual pumping conditions, the viscosity was approximately 500 S.U.s. No serious harm was done, but a more-expensive, large, low-speed pump was installed where a smaller and higher speed could have been used.

To avoid the possibility of a similar error, the plant engineer should study the data taken from similar installation. Such information should consist of type, size, capacity, and speed of pumps already installed. Suction pressure and temperature at the pump-inlet flange, total working suction head, and above all the pressure drop in a specified length of piping should also be included. From the latter, you can get an excellent approximation of viscosity under actual operating conditions.

From material prepared by W. J. Mongon, De Laval Steam Turbine Co., Trenton 2, N. J.

by W. L. Nelson
Technical Editor

Properties of Petroleum Coke

What are the qualities of fluid coke such as B.t.u.'s, volatility, ash content, etc.? Is further processing required before it can be used as a fuel for power generation? What is its hardness compared with coal? G. E. M.

Something of the properties of petroleum cokes can be judged from the analyses shown in Table 1. The composition of the ash is, of course, much the same as the composition of the ash found in the parent crude oil. Examples of such analyses were published in the December 7, 1950, issue of this page (p. 105) and Table 2 herein indicates the analyses of four ashes contained in fluid cokes. The screen analysis of pilot-plant and commercial coke from the Carter Oil Co. plant at Casper, Wyo., is indicated in Table 3. Late specifications for petroleum cokes are indicated in Table 4.

The amount of sulfur in the coke is related to the amount in the feed stock ranging from 25 per cent below to as high as 104 per cent above the percentage of sulfur in the feed stock. Some information has been published on page 125 of the March 9, 1953, issue of this page. The average coke contains 26 per cent more sulfur than its parent feed stock.

The volatile matter in petroleum cokes generally ranges from 2 up to 20 per cent, and the corresponding percentages of hydrogen, solubility in trichloroethylene, and friability,

TABLE 3—SCREEN ANALYSES OF CARTER FLUID COKES[14]

	Pilot plant	Commercial plant
Volatile matter, weight per cent	5.3	3.8
Ash, weight per cent	0.37	0.1
Screen analysis, per cent:		
Retained on 48 mesh	0-5	5
Retained on 100 mesh	40-80	75
Through on 200 mesh	below 10	8

TABLE 2—ASH ANALYSES OF FLUID COKES
(Martin et al.[10] and Thornton[14])

Crude source of vac. pitch feed—	S. Louisiana mixture	Hawkins (Texas)	Elk Basin (Wyoming)	Carter[14] plant
Ash, weight per cent	0.785	0.332	0.370	0.10
Components, weight per cent of metal:				
Nickel	0.021	0.010	0.011	0.01
Vanadium	0.003	0.015	0.035	0.03
Iron	0.055	0.007	0.003	<0.01

TABLE 4—SPECIFICATIONS OF PETROLEUM COKES

	Metallurgical grade[3]	Aluminum electrode[3] — Green	Aluminum electrode[3] — Calcined	Abrasive manufacture[3]	Carbide manufacture[3]
Volatile matter	4.5-8.0	12 max.	0.5 max.	9.0 max.	13.0 max.
Sulfur	0.5 or less	1.5-2 max.	1-2 max.	1.0 max.	1.0 max.
Ash	0.75 or less	0.5-1 max.	0.5-0.8 max.	1.0 max.	2.0 max.
Calcium		0.12 max.	0.12 max.		(phosphorus
Iron		0.06 max.	0.5-0.8 max.		under 0.1%)
Silicon		0.06-0.08 max.	0.5-0.8 max.		
Sodium		0.12 max.	0.12 max.		
Combined Fe-Si		0.14 max.	0.14 max.		
Combined Na-Ca		0.12-0.15 max.	0.15 max.		
Soluble salts		0.2-0.8 max.	0.8 max.		
Real density			2.01-2.07		

TABLE 1—ANALYSES OF PETROLEUM COKE

	Early pet. cokes (1930-1935)							Fluid process cokes				
	Cracking still	Coking still	Oven coke*	Oven coke (Curran)	Delayed process cokes — Range†	Range	Range	So. La. mixture (0.9% S)	Elk Basin (3.5% S)	Hawkins (4.5% S)	Carter plant (3.85% S)	Contact coke (0.6% S feed)
Moisture, per cent by weight	0.15-3.3	0.3-1.8	0.3-1.1	1-2	nil 0.5							
Vol. comb. matter, per cent by weight	8-18	2-13	1-7.4	0.6-1.15	8-12	8-18	10-11.5	5.0	5.3	5.0	3.8	3.7
Ash, per cent by wt.	0-1.6	0.5-1.2	0.2-1.8	0.2-1.0	0.2-1.3	0.05-1.6	0.4-0.5	2.8	0.7	0.7	0.1	1.0
Sulfur, per cent by weight‡	0.2-4.2	0.5-1.2	0.8-1.5	1-1.09	0.5-3.5	0.2-4.2	1.4-1.7	1.4	6.4	7.0	6.1	0.6
Salt, per cent by wt.							0.1-0.15					
Bulk density, lb. per cu. ft.	56-69								55-65		60	64
True or real density, grams per ml.						1.28-1.42			1.5-1.6		1.5	
B.t.u. per lb. as received	15,300-16,400	14,500-15,500	14,400-14,700						14,000		14,000	
Hydrogen, per cent by weight								1.6	1.8	1.9	2.1	
Carbon, per cent by weight								92.5	88.6	88.3	89.1	
Sulfur, per cent by weight								1.4	6.4	7.0	6.1	
References	16	16	17	2 & 12	1	4 & 5	8	6 or 10	6 or 10	6 or 10	14	6

*As produced in 1935 in vessels constructed of ceramic materials. †Altogether a function of the amount of sulfur in the feed. See Sulfur Content of Petroleum Coke, The Oil and Gas Journal, March 9, 1953, page 125. ‡Silica and iron oxide, nil to 0.5 per cent by weight.

are somewhat as follows (Berry and Edgeworth - Johnstone, Ind. Eng. Chem., 36, 1140 (1944):

Per cent volatile matter	Per cent hydrogen	Solubility in trichloroethylene	Friability (arbitrary units)
2	1.4		1.5
5	2.0		2
10	2.9	10	5
15	3.8	26	14.5
20	4.7	42	26

The bulk density of petroleum coke ranges from 55 to 69 lb. per cu. ft. (density 0.885-1.11) and the true or real densities of carbon materials are about:

Chamber and oven coke	1.28-1.42
Fluid coke	1.4-1.6
Calcined coke	2.0
Graphite	2.25
Diamond	3.5

According to C. L. Thomas (Petroleum Coke and Coking, Progress in Technology, A.C.S., September 1951) the electrical resistivity of some petroleum cokes, etc., are about as follows:

	Ohm-in.
1.39 density coke	9×10^6
Calcined for synthetic graphite	0.05
Graphite	0.0004

Thus, even hard raw petroleum coke is more of an insulation than a conductor and it must be calcined to some extent before it can be used for electrodes. The degree of calcining used in preparing aluminum electrode coke does not produce what is commonly called synthetic graphite but this is the term used in describing the electrode material used in the production of electric steel.

Low-volatile-matter cokes are stronger and harder than high-volatile-matter cokes. This is indicated by the friability tests in the first tabulation on this page. C. L. Thomas also indicates the following behavior in the A.S.T.M. shatter test.

Volatile matter (per cent)	Percentage of 2-in. lumps remaining after test
14-18	None
8-10	83 (74-93)
2.1	91 (89-93)

Most petroleum drum coke is not strong enough for use in foundry cupolas. By processing it in gas retorts to a volatile matter of 2.1 per cent (see above) it is possible to produce cupola coke of satisfactory strength. When using this coke, the silicon loss was 30-40 per cent less than normal. In open-hearth steel manufacture, Wilson Carbon Co. (Pet. Processing, March 1952, page 351) found that the carbon in petroleum coke is readily available (95 per cent as against 15-25 per cent of that in coal) for absorption into steel. Fluid coke with its low volatile matter (3.7-5.3 per cent) is harder than chamber cokes and most oven cokes. Likewise, it is harder to grind than bituminous coal.

Fluid process coke as fuel . . . Although large amounts of coke are now used for aluminum electrode manufacture, for electric-steel (magnesium and zinc) electrodes, in abrasives, in calcium carbide manufacture and many other lesser uses, the percentage of sulfur in most petroleum cokes by present methods of processing is so large that any great increase in the use of coke must come by using it as a fuel. All petroleum coke has a high heating value (14,200-15,300 B.t.u. per lb.) and it contains less ash than coal. In fact the low ash content is sometimes troublesome when it is fired on grates because too high temperatures are attained and the grates are "burned."

Fluid coke consists of rounded particles in the size range of 20-100 mesh which can be handled as a fluid but which is relatively clean and dustfree. It is harder and stronger than drum coke and much harder than average bituminous coal. Should a truly large production of fluid coke become available as a fuel, ways of burning it will undoubtedly be developed. Thus, if grates tend to be burned out because of the low ash content, there will be modifications in grate design. If grinding in conventional mills is difficult, then mills better suited to the friable nature of fluid coke will be adopted. Finally, special means of burning the coke as is or only slightly modified, may be devised. It has a higher ignition temperature than coal which is an advantage with respect to safety and storage but an added complication in firing.

The paper by F. T. Barr and C. E. Jahnig, "Fluid Coking and Fluid Coke," Chem. Eng. Progress, April 1955, page 167, is an excellent discussion of the handling and the use of fluid coke as a fuel. In transporting coke continuously through distances of a few thousand feet, conventional air activated pneumatic transport, the Fuller - Huron Airslide, or belt conveyors may be used. The fluid-solids technique may be used for vertical lifts. For greater distances, conventional truck, rail, barge, or ocean transport may be used except that a covering of some sort must be used on trucks or rail cars such as a tarpaulin to avoid wind losses. Open piles must also be protected from the wind, possibly by spraying oil or tar on the surface of the pile. Conventional covered bins, silos and tanks are obviously satisfactory. Powdered coke is reported to behave almost the same during burning as low volatile bituminous coal. The use of 15-30 per cent of auxiliary high volatility fuel may be necessary to obtain proper ignition and the maintenance of a stable flame. As with coal, finer grinding is helpful.

The cost of grinding fluid coke is greater than the cost of grinding coal, the cost amounting to perhaps 60 cents per ton. It may be feasible to burn a coarse coke even though the amount of unburned carbon is relatively large.

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Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

• **Big Horn Pipe Line Co.** — Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

• **Lakehead Pipe Line Co., Inc.**—Company plans to loop part of present system with 51 miles of 26-in. line. The job will be completed about August 31, 1956, and is in conjunction with 69 miles of 24 and 26-in. looping that Interprovincial Pipe Line Co. will also complete in August. (See Interprovincial under Canada, also).

Pasotex Pipe Line Co.—Company has let contract to McVean & Barlow and River Construction Corp. for 68 miles of 20-in. looping of its Wink, Tex., to El Paso crude line. The line will partially replace two existing 8-in. lines. Completion set for first of year.

Pure Transportation Co.—R. H. Fulton & Co. is winding up 31 miles of 6 and 8-in. gathering lines in the Dix area of Kimball County, Nebraska. Job will be completed December 15.

Salt Lake City Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 82 miles of 10-in. line to loop the present Rangely, Colo., to Salt Lake City system of this company. The job will be finished about the first of the year.

Sun Oil Co.—Eunice Contracting Co. will wind up about December 1, 26 miles of 6-in. line from Bayou des Cannes to Kinder, La.

• **Union Oil Co. of California.**—Company proposes to build an 815-mile line from Rifle, Colo., to Los Angeles to carry the products from its proposed Rifle, Colo., shale-oil plant to the Los Angeles refining area. The line would cost approximately $56,000,000.

• **U. S. Defense Department.** — Defense officials are considering a 97-mile, $8,000,000 line from the Elk Hills Naval Reserve in California to the Los Angeles refining area.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members has recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **Cosden Petroleum Corp.**—Company will build 100 miles of 6-in. line from its refinery at Big Spring to Abilene, Tex.

Inland Corp.—Sheehan Pipe Line Co. will finish work about December 15 on 32 miles of 10-in. from Cleveland to Inland's terminal at Mogadore, Ohio.

• **International Pipe Line, Inc.**—132 miles 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost $4,200,000.

Magnolia Pipe Line Co.—H. B. Zachry Co. and O. R. Burden Construction Co. are winding up work converting 337 miles of 8-in. and 237 miles of 10-in. from crude to L.P.G. service. Work will be completed December 31.

• **Phillips Chemical Co.**—Firm plans a 50-mile, 4-in. ethylene line from Sweeny, Tex., to Port Adams, Tex. The estimated date of completion is set for October 1, 1956.

• **Phillips Pipe Line Co.**—Firm plans 64-mile, 12-in. products line from Sweeny to Houston. Completion set for April 1956.

• **Phillips Petroleum Co.**—Firm has bids out for 40-mile, 4-in. gasoline line from Lindsay, Okla., to Oklahoma City. Completion set for last of January 1956.

• **Sioux Oil Co.**—Firm plans to build 80-mile, 4½-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D. The line is slated for completion in late 1956.

Southern Pacific Pipe Lines, Inc.—Company has completed more than 700 miles of its 842-mile products line between Los Angeles-Phoenix and El Paso-Phoenix. The only pipe laying left is between Phoenix and Yuma and between La Habra and Beaumont in California. All pipe should be in the ground by January.

• **Sun Pipe Line Co.**—Firm will build 110 miles of 14-in. from Twin Oaks, Pa., to Newark. The line will have a 83,000-bbl. capacity and will replace an existing 8-in. line. September 15, 1956, is expected completion date.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

Non-Petroleum Pipelines

American Gilsonite Co.—Company has announced plans for a 100-mile pipeline from near Bonanza, Utah, to a proposed gilsonite refinery in western Colorado. The company, owned by Barber Oil Corp. and Standard Oil Co. of California, plans to make gasoline and coke by refining gilsonite. The gilsonite would be moved in a slurry.

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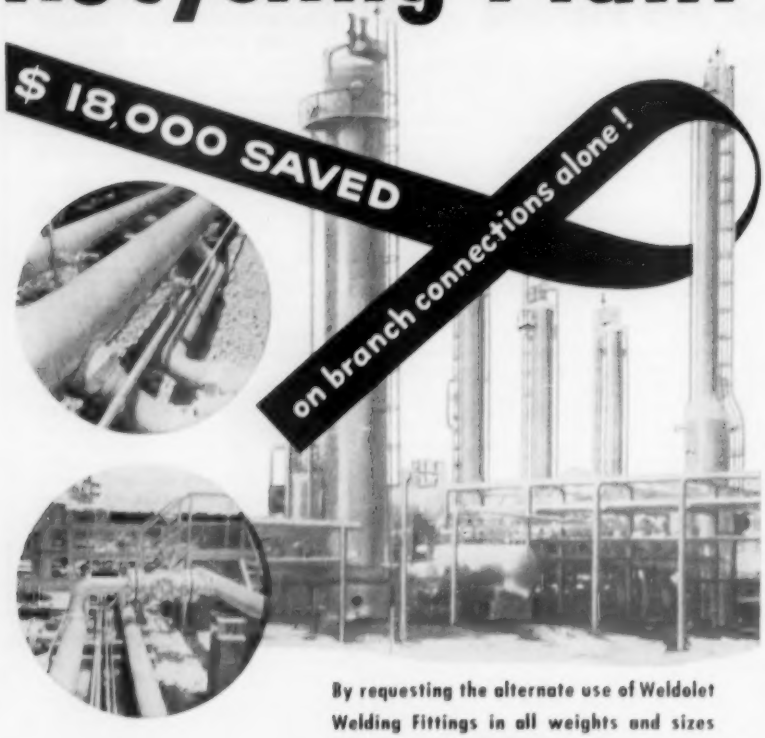

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Pittsburgh Consolidation Coal Co.—This firm has announced plans for the first pipeline to move coal. The line will be 108 miles of 10-in. from the company's Georgetown mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Construction will start this fall. Ford, Bacon & Davis, Inc., will issue specifications, let contracts, and supervise the construction work. Williams Bros. has contract.

Natural-Gas Pipelines

Alabama-Tennessee Natural Gas Co.—Midwestern Constructors, Inc., has contract to lay 21 miles of 12-in. natural-gas line from Little Bear Creek, Colbert County, Alabama, to the Mississippi state line. Job will be completed December 31, 1955.

American Louisiana Pipe Line Co.—Company has let bulk of its 1,121-mile line from North Tepetate, La., to Detroit. Only a 22-in. spur from Payne, Ind., to Bridgman, Mich., is still not awarded. H. C. Price Co., Bartlesville, Okla., has 783 miles of 30-in. pipe. One section will work south from the Hancock-Henry County line and the other will work north from Slaughters, Ky. Brown & Root has 221 miles of 30-in. from North Tepetate to the Louisiana-Arkansas border, and 39 miles of 16-in. line to be built under water. The firm has subcontracted the 221 miles to Associated Pipe Line Contractors and Western Contractors. It will lay the under-water line itself.

• **Carolina Natural Gas Corp.**—185 miles 8-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Cities of Clarendon and Marvell, Ark.**—Cities have filed for FPC permission to interconnect their facilities with Texas Gas Corp.'s line south of Helena, Ark. The cities will build 53 miles of 4, 5, and 6-in. line to transport the gas.

Cities Service Gas Co.—Firm is winding up work on three separate projects:

R. H. Fulton will complete 90 miles of 26-in. from Blackwell, Okla., to Independence, Kans., about December 15.

Vaughn & Taylor Construction Co. is laying 22 miles of 20-in., 15 miles of 16-in., 65 miles of 8-in., 14 miles of 6-in., and 29 miles of 4-in. from Alva, Okla., to gas fields in Barber County, Kansas. Job is to be finished by first of year.

M. A. Moore Construction Co. is laying 123 miles of 4, 6, 8, and 10-in. pipe in the Hugoton gas field in Kansas. The job will connect 87 gas wells and will be finished by the first of the year.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

• **Colorado Interstate Gas Co.**—Firm completed 136 miles of 22-in. from Laramie, Wyo., to Denver in November. Second part of line from Laramie to Rock Springs, Wyo., will be laid in 1956. The second section will be 238 miles of 22-in. pipe and will be completed about October 1.

• **El Paso Natural Gas Co.**—Company plans to increase its delivery to California. Most likely way is to loop its existing 500-mile, 30-in. line from the San Juan basin.

Firm also has FPC approval for 62 miles of 14-in. line from the Tex-Harvey plant in Midland County, Texas, to gas plant in Jameson County.

• **Houston Texas Gas & Oil Co.**—Company has applied to FPC for permission to lay a 960-mile gas line between Baton Rouge and Miami. The main line would consist of 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., and 12 miles

Pipeline Patrol

of 12-in. Company also plans 500 miles of sales laterals in Florida. Main line would join with Coastal Transmission's proposed line from McAllen to Baton Rouge.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an $18,000,000, 230-mile line from Cotton County, Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch (see below).

• **Michigan Consolidated Gas Co.**—25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in loops. Majority will be in Wisconsin.

• **Midwestern Gas Transportation Co.**—Company will build a main line from Portland, Tenn., to Canadian border near Emerson, Man., Canada. Extensions from main line to cities in Minnesota and Wisconsin are also planned. The main line will be comprised of 829 miles of 24-in., 109 miles of 16-in., and 174 miles of 12-in. The extensions will total 648 miles of 3 to 18-in. pipe. The application is now pending with the FPC.

• **Montana-Dakota Utilities Co.**—Company has FPC authority to construct 44 miles of pipeline and 1,090 hp. in compressor capacity on its system in South Dakota and Wyoming. Estimated cost would be $1,414,218.

• **Natural Gas Pipeline Co. of America**—Company now before FPC on plans to build 150 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia to Narrows and Dublin, Va.

• **Northern Natural Gas Co.**—Company plans to spend $32,000,000 to add 348 miles of main line and 307 miles of branch lines in Wisconsin, Minnesota, South Dakota, and Iowa. The application is before the FPC now. The main lines include 169 miles in the Duluth-Superior area and 164 miles in the Aberdeen area of South Dakota.

• **Pacific Gas & Electric Co.**—Company's long-range plans call for looping the Topock Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

Pacific Northwest Pipe Line Corp.—Firm has let the initial contracts of its 1,446 miles gas line from the San Juan basin to Bellingham, Wash. The first contracts total $11,236,000. Contractors and their sections are:

River Construction Co., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling 160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo.

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Hot Springs to Burley, Idaho.

H. B. Zachry Co., San Antonio, sections 9 and 10, 214 miles of 22-in. between Burley and Payette, Idaho.

Fulghum Construction Co., Harrisburg, Pa., sections 11 and 12, 198 miles of 22-in. between Payette and the Columbia River at the Oregon-Washington border.

A. J. Curtis Construction Co., Casper, section 26, 54 miles of 16-in. laterals and 31 miles of gathering-system lines from a point on the main line near Kemmerer, Wyo., to Big Piney field, Wyoming.

R. H. Fulton, Lubbock, section 27, 43 miles of lateral lines and 16 miles of gathering lines from Rangely, Colo., to Piceance Creek field, Colorado.

Panhandle Eastern Pipeline Co.—R. H. Fulton is laying 19 miles of 24-in. line in the Rolla and Hugoton fields of Kansas. Line will be completed by December 31.

Phillips Petroleum Co.—Vaughn & Taylor has contract for 120 miles of 2 through 30-in. gas gathering lines in Garvin, Grady, and McClain counties of Oklahoma. Job will be finished in January of 1956.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000, although later figures have been much higher than this.

• **Southern California Gas Co.** and **Southern Counties Gas Co. of California.**—Firms have plans for three separate jobs. First is 19 miles of 30-in. from Placentia to Compton, Calif. Completion set for November 1956. Second job is 70 miles of 30-in. from Palmdale to Alhambra, Calif., and completion is slated for November, too. Third job

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is 210 miles of 30-in. from Topock to Palmdale. Last job not expected to be finished before April 1957.

• **Southern Natural Gas Co.—Company has temporary FPC authority to build 39 miles of loop lines and add 4,950 hp. to its compressor power near Atlanta, Ga. Job will cost about $2,000,000.**

Tennessee Gas Transmission Co.—The firm has the following projects under way or planned.

Project 1—370 miles of 30-in. line from Agua Dulce, Tex., to Kinder, La. Completion set for December 31, 1955. Contractors are Morrison Constructors, Inc.; Williams Bros.; Houston Contracting Co.; H. C. Price Co.; Western Constructors; N. A. Saigh Co.; Panama-Williams Co.; and Associated Pipe Line Constructors, Inc.

Project 2—250 miles of 24-in. from Coudersport, Pa., to Greenwich, Conn. Completion set for December 1, 1955. Contractors are H. C. Price, Bechtel Corp., and Pentzien, Inc.

Project 3—147 miles of 26-in. and 74 miles of 30-in. Thirty runs from Cave City, Ky., to Danville, Ky. Twenty-six-inch runs from a point north of the Ohio River to McConnellsville, Ohio, and from Newcomerstown, to near Lisbon, Ohio. Approved by FPC but not yet contracted. Completion set for fall of 1956.

Project 4—192 miles of 24-in., 34 miles of 20-in., 15 miles of 18-in., and approximately 110 miles of 4, 6, 8, 10, and 12-in. from point west of Crowley, La., looping the Bayou Sale gathering line for a distance of 74 miles to a point near the mouth of the Mississippi River. Job not yet contracted. Completion set for summer of 1956.

Project 5—63 miles of 30-in. and 99 miles of 26-in. Thirty-inch will run from Scottsville, Ky., to Cave City, Ky., and from point southwest of Danville, Ky., to a point northeast of Danville. Twenty-six-inch will run from near Greenup, Ky., to just north of the Ohio River; from McConnellsville to near Newcomerstown and from Lisbon to Mercer, Pa. Application pending with FPC.

Project 6—Approximately 100 miles of 4, 6, 8, 10, and 12-in. gathering lines in the Gulf Coast area of Texas and Louisiana. Application pending with FPC.

(For news of a Tennessee subsidiary see Midwestern Gas Transmission Co.)

Texas Eastern Transmission Co.—Company has received FPC permission to begin converting its Little Inch line from natural gas to products service. Company has also proposed to Mobilization Director Arthur S. Flemming that the Government give it accelerated amortization on money to invest to put the Big Inch line on standby product service. The company's program is:

. . . To convert the Little Inch to products with a capacity of 235,000 bbl. daily and to install enough standby pumping equipment to hike the capacity to 375,000 bbl. daily if needed.

. . . To install standby pumping equipment along the Big Inch that would allow the line to be converted from gas to products in an emergency. The line would have a capacity of 425,000 bbl. daily.

Company has recently finished a 382-mile, 30-in. line from Beaumont, Tex., to Kosciusko, Miss. Firm also is considering importing Mexican gas and building a 400-mile line from the border into Beaumont.

Company also has 110 miles of 3, 4, 6, 8, 10, and 12-in. pipe being laid in Texas, Louisiana, Arkansas, Pennsylvania, and Mississippi. Work will be completed in early 1956.

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in. H. C. Price Co.

Company will loop 14 miles of 20-in. at Haughton, La. Houston Contracting Co.

Will build 72 miles of 12-in. from Hardinsburg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedford. H. C. Price.

From Bastrop, La., to Clarkedale, Miss., the company will lay 50 miles of 30-in. H. C. Price.

From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20-in. H. C. Price.

• Company has also filed with the FPC for permission to add 198 miles of line and an additional 20,270 hp. in compressor capacity along the route of its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana. The project will cost $20,000,000.

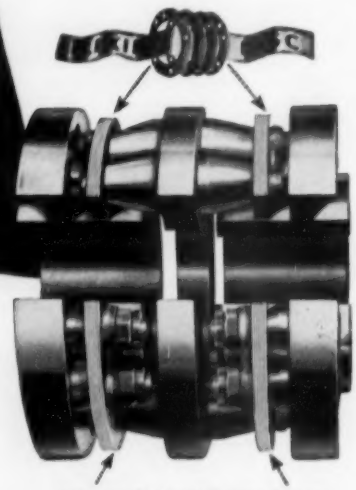
• **Texas Gas Transmission Corp.**—Firm has application before the FPC to add 198 miles of line and an additional 20,270 hp. to its compressor capacity along the route of its system in Louisiana, Mississippi, Arkansas, Tennessee, Indiana, and Kentucky. The project will cost $20,000,000.

• **Texas-Ohio Gas Co.**—Company proposes to build two systems, one from the Houston-Lake Charles area to Miami, Fla., and the other in the Carolinas and Georgia. Neither idea is before the FPC yet.

Transok Pipe Line Co.—Company has let contract to Pipe Line Service Co., Seminole, Okla., to lay a 140-mile, 24-in. line from Garvin County, Oklahoma, to Tulsa. The firm will also build a gathering system in the Bradley, West Lindsay, and Northwest Purdy fields.

• **Trunkline Gas Co.**—Firm has applied to

Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs



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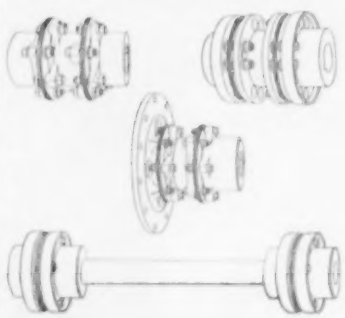

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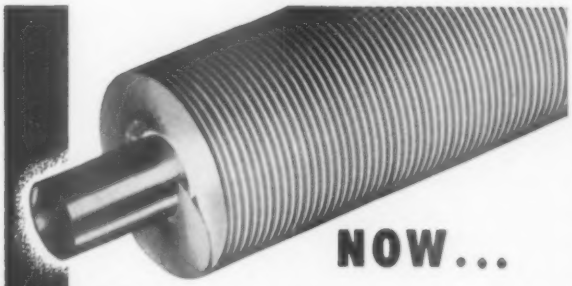

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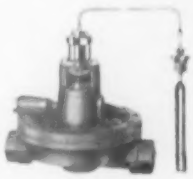

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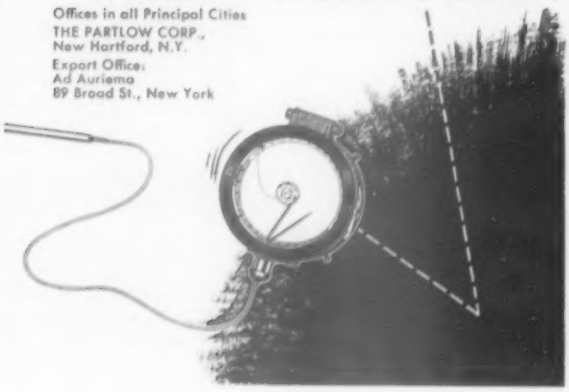

Pipeline Patrol

FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.

United Gas Pipe Line Co.—Firm is winding up two jobs at present. Panama-Williams Corp. will finish 34 miles of 16-in. from Baxterville, Miss., to Petal, Miss., around December 15. Western Pipe Line, Inc., will complete 21 miles of 20-in. from Mobile to Pensacola, Fla., about the first of the year.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Foreign Crude-Oil Pipelines

• **Cremona Pipe Line Co.**—Firm has announced plans for a 60-mile crude-oil line from the Westward Ho-Sundre area to Calgary.

• **Esso, A. G.**—West Germany affiliate of Standard Oil Co. (N. J.) plans line from North Sea port to Rhur-Rhine area. This will probably be 120-mile, 10-in. from Rotterdam to Cologne, the latter rumored as the site of a new 58,000-bbl. refinery to be built by the company.

• **Interprovincial Pipe Line Co.**—Firm will loop 67 miles of 24-in. line and 2 miles of 26-in. along its system from Alberta to Sarnia, Ontario. The job is slated for completion August 1956. (See Lakehead under domestic crude, too).

Peace River Oil Pipe Line Co., Ltd.—Fulton-Banister, Ltd., has contract for 106-mile line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project includes 41 miles of 16-in. and 65 miles of 12-in. Completion is set for December.

• **Pembina Pipe Lines, Ltd.**—Company has announced proposal to build crude-oil line from Sundre-Westward Ho area of Alberta into Edmonton. Two other companies, Cremona Pipe Line Co. and Rangeland Pipeline Co. also have plans for moving the area's crude.

• **Rangeland Pipe Line Co.**—Subsidiary of Hudson's Bay Oil & Gas Co. has made proposal to build line out of Sundre-Westward Ho area to connect with a line of Texaco Exploration Co. and then go to connections with Trans Mountain and Interprovincial.

• **Standard - Vacuum Oil Co.** — Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

Westspur Pipe Line Co.—Firm has received government permission to build a 109-mile crude line from Midale, Sask., to the Interprovincial Pipeline Co.'s system at Cromer, Man. The project will cost $6,400,000.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co.**—Company will spend $47,000,000 to build 547 miles of gas-gathering system for the Trans-Canada line. The 1956 stage of construction will total 219 miles and cost $22,650,000. The first part would start near Saskatchewan and include Pincher Junction, Provost, Bindloss, Sibbald, Oyen, Sunnynook, Steveville, and Cessford. The second part to be built in 1957 will consist of 328 miles and cost $24,400,000. The second phase will include Countess, Duchess, Princess, Homglen-Rimbey, and Nevis.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakaistan.

• **Empresa Nacional del Petroleo.** — 80 miles, 10-in., planned, Concon to Santiago Chile.

• **North Canadian Oils, Ltd.**—Company will lay 316 miles of 10-in. line from Wabumun to Hinton, Alta. The gas will be sold to a pulp mill at Hinton. Mid-Western Industrial Gas, Ltd., which will supply the gas along with North Canadian, will build a line from its gas fields in the Alexander, Majeau Lake, and Westlock districts to Wabumun.

South Alberta Pipe Line, Ltd.—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

• **Sui Gas Transmission Co.** — Pakistan Constructors, a joint company of Morrison Knudsen, Boise, Idaho, and William Press Ltd., London, have contract to build a 188 mile, 16-in. line from Sui gas field to Multan, Pakistan. Work will begin in mid-1956. The line will later be extended to Lahore, with branches at Kot Addu, Jhang, Magiana and Montgomery.

• **Westcoast Transmission Co., Ltd.** — Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta and British Columbia to the United States border near Sumas. Wash. Plans call for work to begin sometime this year. Company has also announced plans for a second line to parallel the first and to swing east into the Okanagan Valley.

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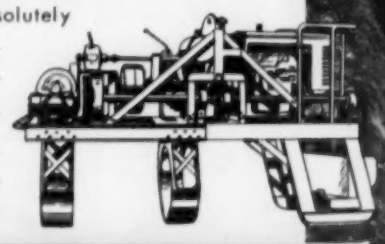

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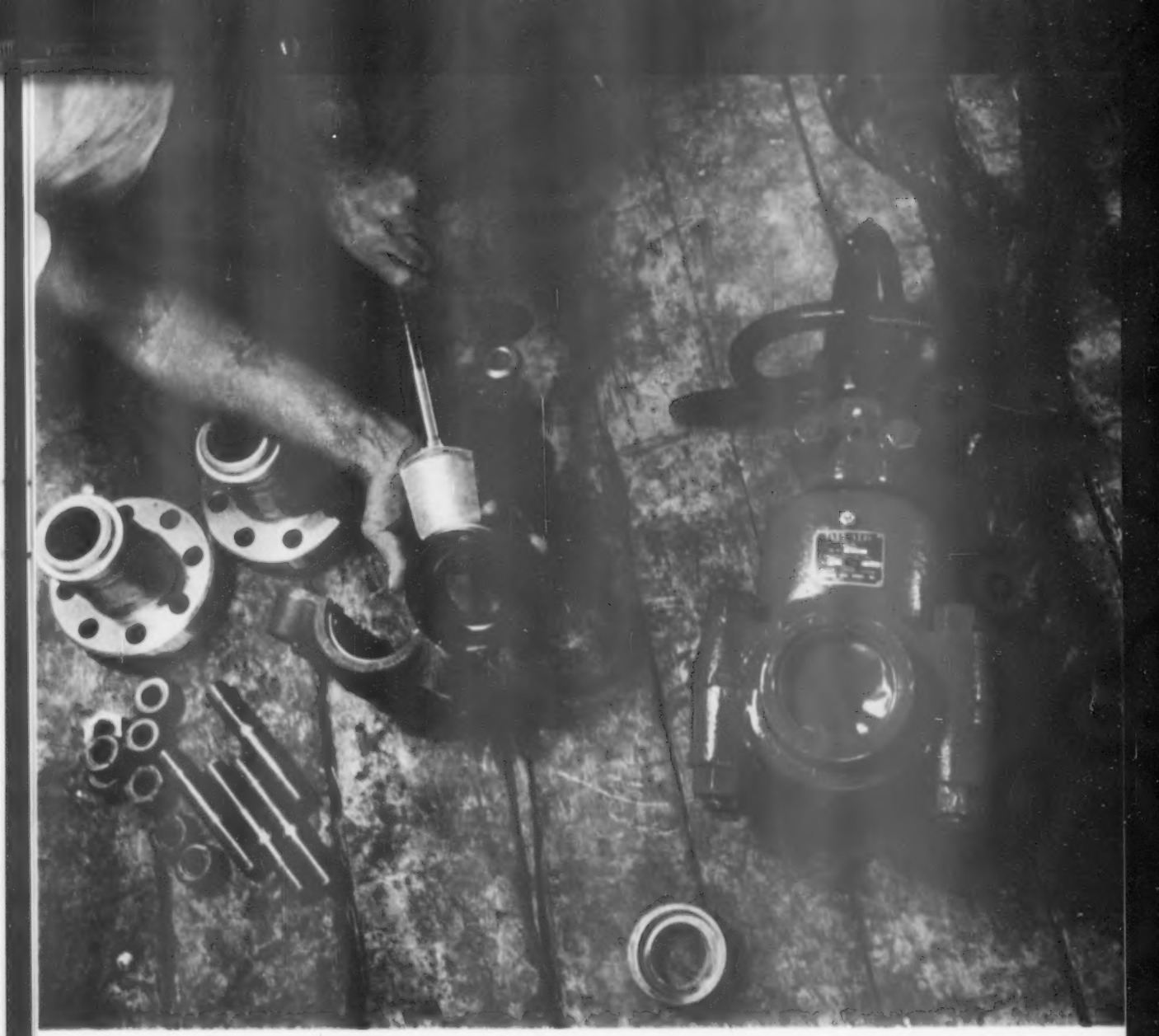

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Drilling Contractors

Midland Contractor Will Engage in Offshore Work

Llano Drilling Co., Midland, Tex., is extending its activities from the West Texas region to Gulf Coast, where it will engage offshore drilling. It has ordered a tender barge from Levingston Shipbuilding Co., of Orange, Tex., and will put in operation a 96 Oilwell rig, capable of drilling to depths of 20,000 ft. The new barge will be 260 ft. and 54 ft. wide, and will carry auxiliary drilling facilities, pipe, and quarters for a crew of 50 men.

Irag Drilling Co. is contractor on a new wildcat operation George Frankel and W. C. English are starting in Houston County, southeastern Texas. Location is on Houston County Timber Co. land, in the Meredith Lynch Survey, 1½ miles south of Kennard.

R. L. Gibson Drilling Co., Tyler, Tex., is drilling Bracken Oil Producing Co.'s new wildcat test, 1 Lipscomb, in the A. C. Waters Survey, ¾ mile northwest of Quitman, in Wood County, East Texas. It is a Woodbine test with a depth objective of 7,000 ft.

Petersen Drilling Co., Shreveport, has two new wildcat operations under way in Jefferson County, Mississippi. One is for its own account at 1 Davenport-Armstrong Unit, about 1¼ miles northeast of Cannonsburg, in 31-8n-1w. It is a 6,200-ft. Wilcox test. The other is being put down on a deal with Clay Oil & Gas Corp. at 1 Shields et al., in 22-8n-2w, south of Church Hill field.

Bryant-Hayward Drilling Co., Oklahoma City, is drilling on a new 7,500-ft. wildcat test south of Stella field, 10 miles northeast of Norman, in northern Cleveland County, Oklahoma. It is a contract job for An-Son Petroleum Co., of Oklahoma City. Location is for 1 Ownby, in 23-10n-1w.

Schafer Drilling Co., Oklahoma City, has contracted for a 7,900-ft. wildcat test to be drilled 5 miles southeast of Norman, in Cleveland County, Oklahoma. Operator is R. E. Hibbert. Location is listed as 1 Farm, in 7-8n-1w.

S. D. Johnson, Denver, has a rig running on a wildcat location in the Valley Ranch area, 13 miles northeast of Torrington, in eastern Goshen County, Wyoming. It is a contract operation for **C. M. & W. Drilling Co., Inc.,** also of Denver. Location, at 1 Valley, in 1-26n-61w, is about 3½ miles from the Nebraska line.

Nebraska Drillers, Inc., Grand Island, Neb., is drilling for Hill Construction Co. at 1 Williams, a wildcat test 11 miles southwest of Harrisburg, in southern Banner County, southwestern Nebraska. Location, in 29-17n-56w, is near the Kimball County line.

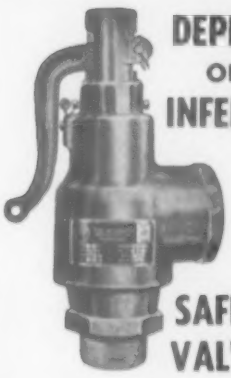
Balderson Drilling Co., Denver, has a new wildcat operation under way 9 miles southeast of Kimball in southeastern Kimball County, southwestern Nebraska. Contract is with Empire Oil Co. and Great Basins Petroleum Co. for 1 Ruegnitz, in 9-13n-55w.

Among newer contract operations of **Wheless Drilling Co.,** Shreveport, are a 14,000-ft. test 1¼ miles west of production at Anse La Butte, in Lafayette Parish, Coastal Louisiana, for Pan American Production Co.; a 7,600-ft. test for Continental Oil Co. in Union County, Arkansas; and a 6,600-ft. gas well for Stanolind Oil & Gas Co. in Carthage field, Panola County, East Texas. The Anse La Butte test, 1 Couret, in 8-9s-5e, already is below halfway to its objective.

Blackie Drilling Co. has the contract for Olin Gas Transmission Corp.'s next well in the new Lake Enfermer gas-condensate field, Lafourche Parish, southeastern Louisiana. It will be the operator's 3-A Grandison, in 10-29s-23e, a south outpost location. Drilling is scheduled for 13,500 ft. This will be the fourth well for the field, discovered last March with production from a 13,000-ft. zone. **Southern Production Co.,** Dallas, has had a rig working for Olin in the field.

Dillard & Waltermire Drilling Co., Houston, is under contract for a deep wildcat test 5 miles north of Angleton, in Brazoria County, Texas Gulf Coast. J. S. Michael is operator. Location is for 1 Moore et al., in the J. W. Cloud Survey. Projected depth is 11,500 ft.

W. P. Taylor Drilling Co. is contractor on a 9,200-ft. test Michel T. Halbouty is starting at a wildcat loca-



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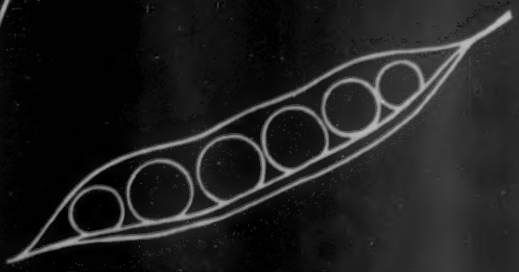

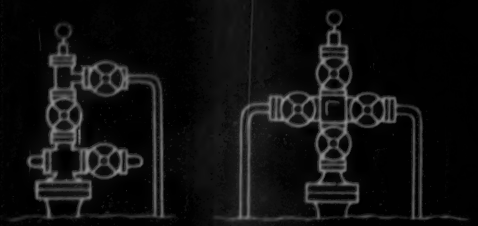

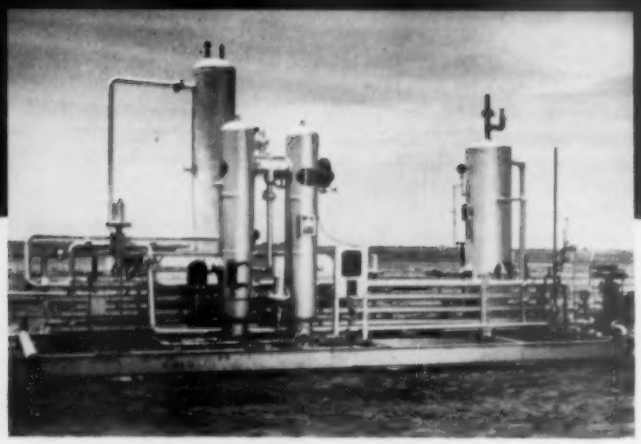

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tion 3 miles south of Altair, in Colorado County, Texas Gulf Coast. Location, at 1 Struss et al., in the J. L. Whitman Survey, is 2 miles northwest of Englehart field.

Chance Drilling Co., Houston, is drilling for Texas Eastern Production Corp. at a wildcat location 2 miles southwest of Hampshire in Jefferson County, Texas Gulf Coast. It is a 12,000-ft. test, 1 Marrs McLean Estate et al., in the B. A. Vacocu Survey, about a mile south of West Hampshire production.

McAlester Fuel Co., Magnolia, Ark., is drilling on a 4,000-ft. test for Carter Oil Co. at 1 Grace, in 31-18s-13w, 1¼ miles southeast of South Hillsboro field, in Union County, Arkansas. The latter field produces from Glen Rose at depths of 3,450 and 3,850 ft. It also is about 1½ miles from 3,400-ft. Travis Peak production in South Hibank field.

W & W Drilling Co., Lewsville, Ark., has contracted for a 2,800-ft. Tuscaloosa test at a wildcat location 1½ miles northeast of Northeast Stamps field, in Lafayette County, southwestern Arkansas. Guy R. Smith, Stephens, Ark., is the operator.

Wise Drilling Account, Tyler, Tex., is scheduled for a 5,400-ft. Woodbine test 2 miles southwest of Rusk, in Cherokee County, East Texas. It is a contract job for Watburn Oil Co., also of Tyler, at 1 Broughton, in the G. W. Brashear Survey.

Drilling & Exploration, Inc., Houston, has a new operation under way for LaTex Oil & Gas Co., of Shreveport, on the southwest flank of Franklin field, in St. Mary Parish, Louisiana Gulf Coast. It is a 13,500-ft. test, 2 Foster, a location removed from the operator's recently completed 1 Foster oil well.

A. W. Thompson, Inc., Houston, will drill a deep test for Cabot Carbon Corp. at a wildcat location southwest of the shallow King area, 12 miles southeast of Tatum in northeastern Lea County, New Mexico. The test is carried as 1 Howard Fleet et al., with location in 35-13-37. Drilling is projected to 13,100 ft.

Justiss-Mears Drilling Co., Jena, La., has contracted for a 7,200-ft. Wilcox test to be drilled at a wildcat location 2 miles northeast of Boggy Bayou, in Concordia Parish, eastern Louisiana. The test, 1 Fairbanks, in 10-4n-6e, is for Burton-Price Industries, Inc., of Dallas. It is nearly 3 miles northwest of Bee Brake field, nearest production.

FREFLO

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Tiny water droplets can kill or cripple oil and gas production when they lodge in the microscopic passages of the formation. Freflo*—another new product developed by Dowell—is helping operators throughout the oil country to break this troublesome water bottleneck.

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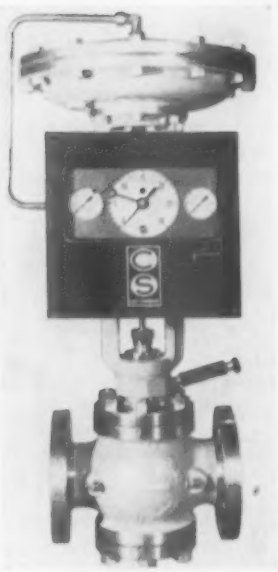

A. W. Cash Introduces Pressure, Temperature Pilot

A new pilot provides extremely accurate and dependable control of pressure and temperature. Known as the Type 51, the pilot permits regulation of temperature as well as pressure. The pilot is applicable for pressure ranges from 0-15 to 0-10,000 psi., and 0-30 in. H_2O and 0-30 in. Hg vacuum. Pressure-sensing elements are available in phosphor bronze, beryllium copper, or stainless steel.

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Petroleum Filters Are Sigma And Unionmelt Welded

Warner Lewis Co. is using sigma and Unionmelt welding to fabricate a complete range of petroleum filters. Used on pipe lines, tank farms, fuel trucks, terminals, and tankers, where X-ray quality welds are required, these filters protect accessory equipment from contamination by water and dirt. The filters are available in any capacity from 10 g.p.m. purification rate, to 1,200 g.p.m. In addition to the carbon-steel and aluminum-bronze plate from which these units are made, others have been fabricated of aluminum.

Sigma welding is used to fabricate aluminum-bronze units on which the metal thickness ranges from ⅝ in. for the drum section, to ¼ in. for the flange. No postweld treatment is necessary, and butt welding speeds average 20 in. per minute. Unionmelt welding is used to fabricate the carbon-steel filters shown here. These are generally larger than the aluminum-bronze units and are welded in one pass. A 9-ft. longitudinal weld and a 75-in. circumferential weld are made in the ⅜-in. steel plate at an average speed of 28 in. per minute. **For more information write or call: Warner Lewis Co., P. O. Box 3096, Tulsa, Okla.**

The OIL AND GAS JOURNAL Showcase Coupon

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OIL AND GAS JOURNAL Showcase OF NEW EQUIPMENT

Two-Way Radio Developed For Drilling Rigs

A new 100-watt output General Electric two-way FM radio station for drilling rigs will provide coverage over an area approximately 20 per cent greater than that of the conventional 50-watt station. This new unit is particularly suitable for operations where rigs are widely scattered and where they may be 80 to 100 miles from the nearest field office.

The transmitter-receiver unit is supplied with a special accessory package so that it can be quickly installed on all types of rigs, including drilling barges and platforms. The accessory package includes heavy-duty rig-type antenna, mounting stand, and extra weatherproof speaker for the drawworks.

The unit can be supplied for operation from 6 or 12-volt storage batteries or from 110 volts a.c. or d.c. A battery charging system for mounting on the engines or compound is optional. **For more information write or call: Communications Engineering Co., 900 Dragon Street, Dallas, Tex.**

•

Hydraulically Adjustable Substructure Eases Rigup

A new type substructure eases rigging up and moving in well-servicing work. Substructure height is hydraulically adjustable so that it can compensate for ground conditions around the well head as well as christmas-tree height. Thus, it is not necessary to lay a thick base of timbers in order to get a blow-out preventer under the floor on a high well head.

The substructure has a hydraulic jack in each of the four corners. These jacks are manually operated, but they could be fitted for power operation if that were desirable. The driller has his choice of any substructure height from 8 to 13 ft.

Rotary table and its counter shaft are built into the unit so that only one chain need be connected to rotate the pipe. As the photo shows, the substructure also carries a ramp for the wheels of a truck-mounted well-servicing unit. Part of this ramp folds back to keep over-all length down for moving.

Total weight of the package, with rotary, is 33,000 lb. For moving, it is

32 ft. long, 10 ft. wide, and only 8 ft. high. This low height for moving is a great advantage in routing the unit on highways with low-clearance obstructions. **For more information write or call: Unique Mast & Equipment Co., 1206 Nance, Houston, Tex.**

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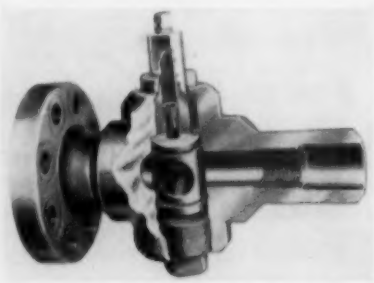


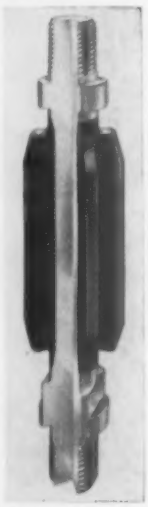
Hot-Tap Valve Made For Tapping Under Pressure

The Hanby hot-tap valve is specifically designed for use in tapping gas-transmission lines under pressure and, after extensive field tests, is now in commercial production. The body of the valve is machined from a solid one-piece forging. There are no bonnets to leak, no bonnet bolts to corrode.

The stuffing box is fully enclosed as part of the body. Plastic packing is inserted through a removable set screw in the side of the valve. Designed in accordance with A.S.A. Series 600 standard (B16.5), it is also an excellent blow-down valve on drips or low places in the line. **For more information write or call: Oil Well Supply Division, United States Steel Corp., Box 478, Dallas 21, Tex.**

•

New Sucker-Rod Guide With Hycar Bearings



A new resilient sucker-rod guide (centralizer), known as the Petromec Wear Guard, consists of a special alloy-steel sucker-rod connector with Hycar (synthetic rubber) fluted bearings molded on. It resulted from an effort to reduce tubing wear below that occasioned by the use of metal guides. Being flexible, the bearings equalize the wearing pressure and distribute it over a much larger area.

The Wear Guard cuts the rate of wear on tubing by roughly half as compared to conventional metal guides. Field tests show that the effective service life of Wear Guards is very satisfactory. **For more information write or call: Petroleum Mechanical Development Co., 3803 South Main Street, Houston 2, Tex.**

•

Instrument Costs Cut By PVC Fittings, Tubing

A new line of instrumentation fittings, made of unplasticized polyvinyl chloride and corrosion resistant flexible tubing, are designed for long service life and are especially useful where corrosive atmospheres exist.

Because of their corrosion-resisting qualities, strength and low cost, the

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We at the Woodward Governor Company have always been ready, willing and able to give users of our equipment competent, economical and, whenever necessary, very fast service, for routine governor overhauls or for emergencies that arise on rare occasions. When speed is important we have a fleet of airplanes and several competent pilots to transport governors or service men quickly.

BUT—a lot of users of our equipment don't seem to know about this. Here's the story:

Our experienced people, using the best and most expensive special tools, test stands, and other facilities in our plant can rebuild a governor in a minimum time. They install all the latest improvements, so the rebuilt governor often works better or lasts longer in service than when it was new.

In most real, but fortunately rare, emergencies, we can do the job in one day, though ordinary jobs require more time because our shop is very busy.

The cost, labor plus regular list price for parts, depends on how clean the governor has been kept, its age, engine roughness, and other factors.

Here are four ways to have your governor put in new condition, with a new governor guarantee on work done in our plant:

1. REPAIR AND RETURN

While your engine or turbine is shut down for other work, return the governor to our factory in Rockford, Illinois. No return tags needed, no formalities—just make sure your company name is on the crate. It helps too, if your purchase order lists the governor serial number. Some governors of which only one or a few were built can only be handled this way. In most cases the unit exchange plan below is better and the cost is the same.

2. UNIT EXCHANGE

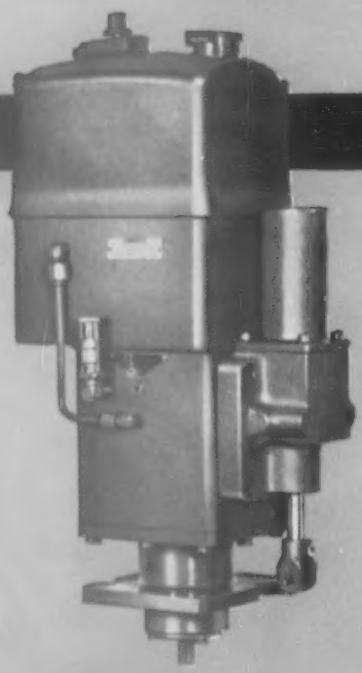
Send us a purchase order with the serial number of your governor, and tell us when you plan to shut down to install it. We'll ship a governor like yours but with all the latest improvements. It takes only a few minutes to remove the old one and install the replacement. Send the old governor back to us for overhaul, and we'll keep it in our stock ready for the next plant that needs it. Try to order early when possible, and we'll try always to give same day service IF there's a real emergency. The cost? Same time and material as above. You pay shipping costs.

3. OVERHAUL OR REPAIR IN YOUR PLANT

This is the most expensive and least satisfactory way to overhaul a governor, but if an emergency or special circumstances make it desirable, we'll send a man to your plant.

4. DO IT YOURSELF

Some competent mechanics repair their own governors in the field, though there usually isn't much saving in doing so. Give us the serial number of the governor and we'll send bulletins and suggest parts you may need. If you have a lot of governors, send your repair man to our plant for two to four days training. If you're having some little trouble, write us about it and maybe we can tell you the cause. HALF THE GOVERNOR TROUBLES AREN'T IN THE GOVERNOR—AND MOST OF THE OTHERS COME FROM DIRT. Washing the governor in spirits once a year and filling with clean oil helps prevent trouble. You can easily replace your own oil seals every few years.



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Tell us the serial number of the governor (or typical governors) and what it's controlling (AC generating unit, boiler feed water pump turbine, cat-cracker air blower, etc.). We'll answer promptly.

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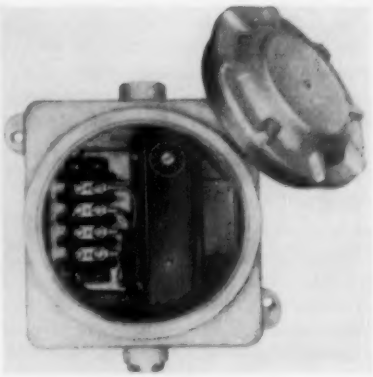
OIL AND GAS JOURNAL Showcase ..... OF NEW EQUIPMENT

fittings and tubing can be advantageously employed in the instrumentation of chemical plants, experimental laboratories, and in processing industries.

These new products permit an entire assembly to be put together by hand without the aid of wrenches, flaring or bending tools, or stretchers. No sleeves or ferrules are involved. All that is needed is a knife or scissors to cut the tubing to the proper length.

The new PVC fittings will hold burst pressures in excess of those to which the flexible tubing may be subjected, and they cannot be overtightened by hand. The tubing itself is practically inert and is not affected by most acids and alkalies. It is extremely tough and durable, yet flexible enough, even at low temperatures, for easy handling and working. It is odorless, tasteless, and nontoxic. The connections and tubing are unaffected by vibration and severe movement.

The fittings and tubing are furnished in both ¼-in. and ⅜-in. sizes. The types of fittings immediately available are half unions, for joining plastic to male pipe thread; unions and bulkhead unions for joining plastic to plastic; connector for joining plastic to female pipe thread, and caps. Maximum working pressure is 150 psi. at 75° F. **For more information write or call: Tube Turns Plastics, Inc., Louisville, Ky.**



Vibration Monitor Made For Hazardous Locations

New explosionproof vibration monitor detects mechanical malfunctions such as failing bearings or unbalance. Applications include gas engines, pump motors, and large fans and blowers. The unit offers valuable 24-hour supervisory protection for infrequently attended equipment by actuating a warning, or causing a shutdown the instant a malfunction develops.

The explosionproof vibration monitor may be provided with either a SPDT or a DPST normally open switch. An adjustment provides for a wide range of normal vibration levels. Electrical rating is 5 amp., at 115 or 230 volts, resistive or inductive.

Aluminum explosionproof housing is designed for Class I, Group D, Class II, Groups E, F, and G, and Class III locations. Weatherproof housing is also available with external reset operator and locking means. **For more information write or call: Beta Corp., Forest Avenue at Ridge Road, Richmond 26, Va.**

•

Submersible Pump Made For Industrial Use

Verti-Line submersible booster pump was designed to provide invisible and noiseless operation, greater safety for both people and equipment, extra dependability in any weather, minimum space requirements, and virtually maintenance-free performance without need of adjustment or lubrication.

The equipment embodies many refinements, such as: oversize shaft, longer bearings with protective caps, perihedral impeller seals, mechanical shaft seal designed specifically for submerged service, and a choice of either mixed-flow or radial-flow impellers. The General Electric submersible motor has a larger oil reservoir and a spring-loaded resilient bag which permits the sealed motor to breathe with changing pressures and temperatures.

Most Verti-Line pumps are factory assembled units, adjusted and tested for optimum performance, so that the equipment is ready for use upon installation without venting, filling, adjustment, or alignment. Standard models available from 5 to 150 hp., with discharge head 50 to 500 ft., and 100 to 4,000-g.p.m.-capacity. They are suited to typical sump, line booster, cooling tower, fire protection and barrel pumping installations. **For more information write or call: Layne & Bowler Pump Co., 2943 Vail Avenue, Los Angeles 22, Calif.**

•

Delta Tank To Offer Welded-Steel Tanks

Delta Tank Manufacturing Co., Inc. has entered production of 90 to 400-bbl.-capacity welded-steel tanks for oil-

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field use. Fabricated from ¼-in. steel plate, the tanks meet A.P.I.-12C code requirements and are designed for assembly in batteries.

Standard fittings of the new line of welded tanks include 24 by 36-in. cleanout openings, antichannel drain lugs, 8-in. combination-pressure-vacuum-relief and thief hatches and walkway lugs. The tanks are shop tested and painted with coats of shop primer and aluminum.

The 90-bbl. capacity tank has a 7-ft. 11-in. diameter, is 10 ft. high, and weighs 3,930 lb. The 200-bbl. tank is 12 ft. in diameter and 10 ft. high, weighing 6,640 lb. The 210-bbl. tanks weigh 6,870 lb. and measure 10 ft. in diameter and 15 ft. in height.

The 300 and 400-bbl. tanks each have 12-ft. diameters. The 300-bbl. capacity tank stands 15 ft. high, and weighs 8,620 lb. while the 400-bbl. model stands 20 ft. high and weighs 10,360 lb. **For more information write or call: Delta Tank Manufacturing Co., Inc., P. O. Box 1469, Baton Rouge, La.**

•

Casing-Thread Protector Is Mechanically Actuated

A new mechanically actuated, quick release casing thread protector, called Rapid-Tector, has a tough, malleable tapered housing which fits over the casing threads. A heavy rubber expander is inserted inside the end of the casing valve where it is expanded mechanically against the inner wall of the casing to hold the unit in place. A quick jerk on the chain releases the locking device and the unit drops free.

The outer protector housing is made of a special alloy malleable enough to withstand the impact of the casing and banging against the steel ramp as it is being drawn through the V-door. All shoulders are tapered to prevent hanging up as the casing is being dragged down the walkway.

A wire line, reel, and reel stand are provided. The reel and stand are mounted at the end of the casing-rack walkway and the wire line is stretched on the rig floor. The Rapid-Tector is attached to the wire line by means of a hook and slides quickly back from the rig floor to the end of the walkway. There are three Rapid-Tectors in each set, one working, one ready to go, and one returning.

All parts are packed in a steel box with three replaceable rubber expanders and the expander setting tool. Total weight is 74 lb. **For more information write or call: Weatherford Oil Tool Co., Inc., 5920 Navigation Boulevard, Houston, Tex.**

•

New Gasketing Developing For Oil Industry Use

A tight sealing gasketing material known as Garlock 662 and developed primarily for use in the oil and chemical-processing industries has been approved by Underwriters' Laboratories for use in equipment where harmful liquids are encountered.

Garlock 662 is a cork-base paper impregnated with Chemigum latex, a water, oil, and gasoline-resistant latex. Chemigum latex permits use of gasketing at temperatures as high as 300° F.

The latex binder is not susceptible to changes in moisture content, thus eliminating shrinkage. This allows users to cut their own gaskets from Garlock 662 sheets far in advance of actual needs. Storage is no problem since the Chemigum latex impregnation gives superior resistance to humidity, high temperatures, and aging.

Primary use for the gasketing is in compressors, oil and water pumps, and processing equipment found in the oil and chemical-processing industries. **For more information write or call: Garlock Packing Co., Palmyra, N. Y.**

•

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The OIL AND GAS JOURNAL Showcase

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Industrial V-8 Engines is a new eight-page bulletin describing industrial H540 and H844 V-8 engines. The three-color bulletin uses 40 halftones, charts, drawings, and diagrams to illustrate the advance design, performance, and economy of these two engines, which operate on gasoline, natural gas, or LP gas. The H540 is rated at 190 hp., the H844 at 285 hp. Both engines are described as of modern, short-stroke design and built to withstand the rugged, heavy-duty service required of industrial, generator service, and oil-field applications. They are short in over-all length, light in weight, and easier to install than comparably rated in-line engines. **For more information write or call: Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.**

●

Instrument Tubing Supports. A new 12-page Catalog 255 fully describes and illustrates the complete Instrof system for supporting instrument tubing of all types. Also included in this new catalog is the pin-type coupler, with which all major units of the Instrof system are now equipped. These couplers permit all sections to be joined together in a matter of seconds to form strong mechanical joints. **For more information write or call: Instrof, Inc., 711 South 50th Street, Philadelphia, Pa.**

●

Solenoid Operated Shear-Seal Valves are cataloged by major service condition: air, oil, water. There are three bulletins: 5S-A, covering air valves 0 to 250, 1,000 to 1,500 psi.; 5S-H, covering oil valves 0 to 250, 1,500 and 3,000 psi.; and 5S-W, covering water valves 0 to 250, 1,500 and 3,000 psi. Bulletins include valve characteristics, flow patterns, over-all dimensions, photographs, and ordering data. **For more information write or call: Barksdale Valves, 5125 Alcoa Avenue, Los Angeles 58, Calif.**

●

Johns-Manville Products Handbook is a new 52-page publication featuring 11 lines of J-M products for industry: insulations and refractory products; transite asbestos-cement pipe; packings and gaskets; electrical products; Celite Diatomite filter aids and mineral fillers; Celite Diatomite catalyst carriers, and metal Raschig rings; J-M synthetic silicates; friction materials; pipe-protection materials; floorings; and roofing and sidings. The handbook contains not only product descriptions and essential engineering data but also a great deal of valuable related information. For instance, on the subject of thermal insulation problems, the handbook gives methods of calculating heat transmission; tables on heat losses from bare surfaces and equivalent thicknesses of pipes; and graphs on surface resistance for both pipes and flat surfaces. **For more information write or call: Johns-Manville, 22 East 40th Street, New York 16, N. Y.**

●

Sheet On Hose Couplings. Among couplings illustrated and described with complete specifications and recommended uses are: short and long-shank common couplings, barbed insert, quick-acting, Bar-way reattachable, interlocking high-pressure, Permalock Type D and Type 68 reattachable couplings. Other methods of joining hose, as described in the new data sheet, include Punch-Lok clamps, menders and

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nipples, inserted pipe nipples, combination nipples, built-in pipe nipples, Flexseal hose joint, flanges and integrally flanged hose end. **For more information write or call: B. F. Goodrich Co., Industrial Products Division, Akron, Ohio.**

•

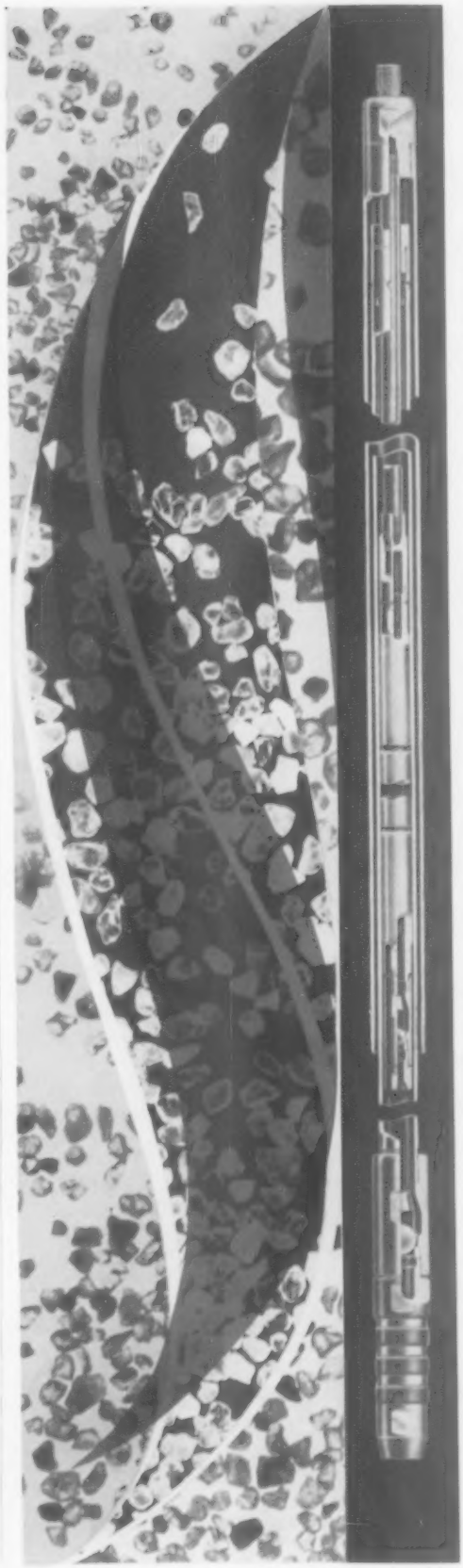
Univac File-Computer System. The versatility of random-access storage on magnetic drums, permitting instant reference to as many as 1,000,000 characters of business data with the Remington Rand Univac file computer, is the subject of a new folder, TM 939, released by the company. The random-access storage feature permits entry of the data to the system in the random sequence of its arrival, thus eliminating manual steps such as pulling cards from a tub file, looking up other types of records, and periodic batch processing. Another feature of the Univac file computer is the simultaneous operation of up to 32 universal language input-output units, any combination of punched card, magnetic tape, perforated tape, line printer, electric typewriter, 10-key tape printer, and key punch units. **For more information write or call: Remington Rand Division, Sperry Rand Corp., 315 Fourth Avenue, New York 10, N. Y.**

•

Dresser Couplings and Compression Fittings. Well illustrated, both by photographs and drawings, the new catalog explains simplified methods of pipe connecting and maintenance. Tracing the use of these products from tanks to pumps, and on truck and trailer piping, the new catalog shows the use of Style 88 Copr-Tube fittings for joining copper tubing, Style 65 no-thread fittings and Style 90 heavy-duty fittings for above and below ground piping respectively. The catalog also describes how standard Style 38 couplings are used to connect centrifugal pumps to inlet manifold pipes, and on discharge pipes from the pump. **For more information write or call: Dresser Manufacturing Division, Dresser Industries, Inc., Bradford, Pa.**

•

TK-2 Lining and TK-31 Coating. A new bulletin covers TK-2 plastic lining, new custom coating process, and a new product, TK-31, a modified Epoxy plastic coating. The literature points up the applications for the lining as a specific preventive of corrosion damage and paraffin deposition. Actual case histories are used to show the results of lining equipment with TK-2. Literature covering the new Tube-Kote plastic service, custom coating, explains



Best For Pumping Sandy Wells Harbison-Fischer Texas Stripper Rod Pumps

This special stripper well rod pump is designed to prevent the plunger from becoming sand locked during shut-down periods, and to pump wells with excessive trash and float sand. The discharge ports in the pump are completely enclosed by a long, reciprocating outer jacket tube which protects the plunger from being directly exposed to settling matter in the fluid column. The bottom-discharge of the fluid also helps to keep sand suspended in the oil. Texas Stripper Rod Pumps are available in a wide range of barrel tube and plunger combinations (including all-Monel pumps) in 2" x 1 1/16" and 2 1/2" x 1 1/2" sizes. Ask your store or write to us at P. O. Box 127 in Fort Worth, Texas, for an illustrated bulletin.

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Fort Worth, Texas

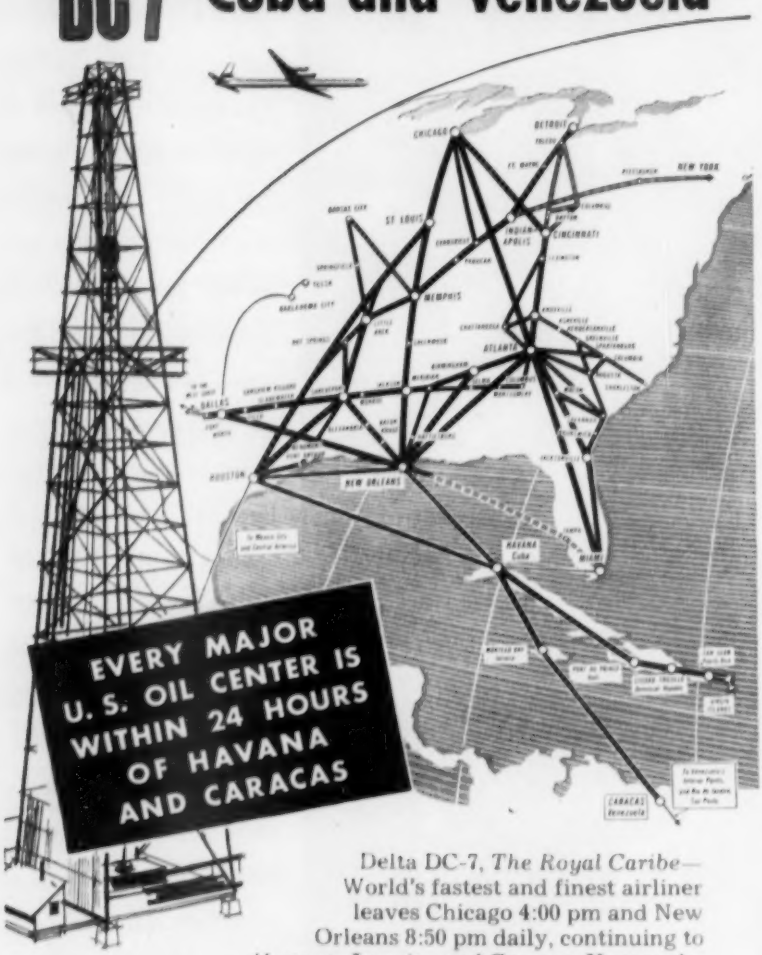
Best Pumps in the Oil Patch

DC-7

The Royal Caribe

GOLDEN CROWN SERVICE TO

Cuba and Venezuela



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how specialty items can be protected against corrosion, contamination, and sticking. TK-31, modified Epoxy coating, is introduced in a circular which lists its applications. The informative literature explains what can be expected of TK-31 and why it is a practical coating for tubular goods and many other oil-field and refinery uses. **For more information write or call: Tube-Kote, Inc., P. O. Box 20037, Houston 25, Tex.**

•

Asphaltic Pipeline Enamels and Primers. A new service manual describing the proper use and applications of pipeline enamels and primers covers 27 steps of procedure and contains a number of useful specification tables. The purpose of this manual is to provide the customer, the contractor, and the pipeline operator with a guide to procedures for the proper cleaning, priming, and coating of line pipe with hot applied asphaltic pipe enamels. Some of the subjects covered include: preparing the surface of the pipe for priming, priming procedure and specifications, inspection of wrapping felts, applying the covering, cleaning and removal of scale and slag, and coating pipe for river crossings and swampy lands. In addition, coverage data for primers and asphaltic enamels as well as standard mathematical tables provide useful reference material. **For more information write or call: Plico, Inc., 1566 East Slauson Avenue, Los Angeles, Calif.**

•

New Light on the Problem of Water and Mud-Blocked Wells. This six-page, four-color fold-out discusses the problems involved in blocked wells and then shows, with formation diagrams, just what Control-Flow does to increase production. Case histories of five problem wells treated with Control-Flow are included. **For more information write or call: Mud Control Laboratories, Inc., P. O. Box 1315, Oklahoma City, Okla.**

•

Tight-Closing Rubber-Seated Butterfly Valves. Butterfly valves, offering minimum space requirements, drop-tight performance, and meeting all A.W.W.A. design specifications, is the subject of a new four-page color bulletin, 650-L1B. In addition to containing descriptive product and installation photos, the bulletin includes design information on the valve sizes, components, type operators, accessories, and lists main advantages. **For more information write or call: Builders-Providence, Inc., 345 Harris Avenue, Providence, R. I.**

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SERVCO

"K" Monel Drill Collars

No iron...yet stronger than steel

Before you know it, you can be over a lease line, if errors creep into your surveys.

And they *do* creep in . . . if magnetism creeps into the drill collar and throws off compass readings. Magnetism can develop in collars with large iron content through cold working from vibration, stresses, or stray induction.

As the hole goes down, these hidden errors often accumulate; may throw you far out of line, into trouble.

How can magnetism be prevented?

You can avoid it with Servco Drill Collars made of "K" Monel* age-hardenable nickel-copper alloy. They are iron-free and permanently non-magnetic.

You can also avoid another major source of error, drill string magnetism. It's simply a matter of using collar lengths and compass spacings worked out by Servco engineers to isolate the instruments effectively from magnetism in the string.

Is drilling speed affected?

Servco "K" Monel alloy Drill Collars *save* rig time.

For one thing, the high density of this age-hardenable nickel-copper alloy puts extra weight right above the bit. Just where you want it. For another, you can use your most efficient bit . . . since there's no need to round trip to take survey readings. Finally, you can really push a "K" Monel Collar. It's stronger than steel; corrosion-, wear-, and abrasion-resistant.

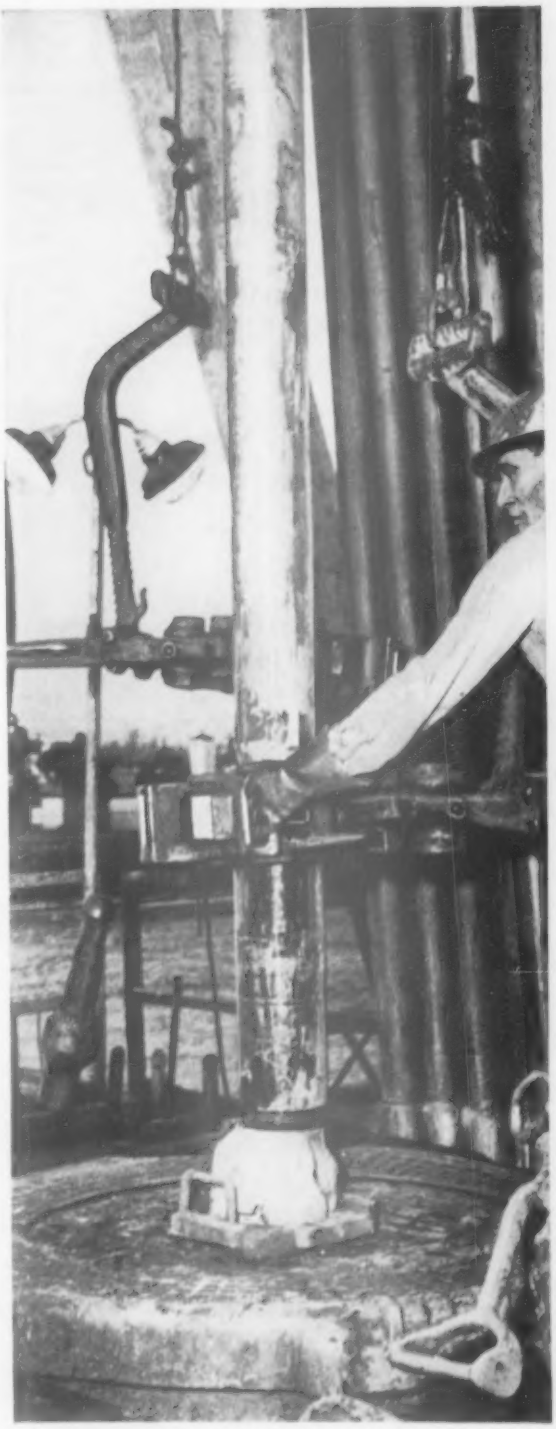
THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO

TRADE MARK

Makes 32 sizes and types of "K" Monel Drill Collars—During nine years of making and distributing directional drilling equipment, Servco has developed a complete range of standard and special "K" Monel Drill Collars, adapted to either top or bottom landing methods. Stocks include special types such as Gilligans, drill pipe singles, pup joints. You can order diameters from 3½ in. O.D. to 9½ in. O.D., lengths from 14 ft. to 33 ft., tool joints of either welded or super shrink grip type. Just contact your nearest Servco office.



Non-magnetic Servco Drill Collar of "K" Monel age-hardenable nickel-copper alloy being lowered into the hole. Collar protects survey instrument (carried inside) from undue magnetic influence. Adds extra weight just above the bit, too.

* * *

Home office of The Servco Company is in the Security Bldg., 9th floor, Long Beach 2, California. Other offices in Bakersfield, Ventura, Houston, Lafayette, Oklahoma City, Denver, Casper.

*"K" Monel is a registered trademark of The International Nickel Company, Inc., which is applied to age-hardenable nickel-copper alloys produced and marketed by it.

EQUIPMENT MEN . . . in the News

United Supply and Manufacturing Sold

United Supply & Manufacturing Co., Tulsa, a large independent oil and gas-well supply company, has been sold to Graham-Paige Corp., an eastern investment firm. The announcement was made jointly by H. B. Gutelius, chairman of United, and Rear Admiral John J. Bergen, chairman of Graham-Paige.

United has 28 offices and stores serving the Mid-Continent, Gulf Coast, West Texas, and New Mexico oil fields. Its annual business is about $20,000,000. The company's name and personnel will remain the same. Gutelius, who founded the company in 1936, will continue as chairman while H. Brooks

H. B. GUTELIUS

GUTELIUS, JR.

Gutelius, Jr., will remain as president. Admiral Bergen and Irving Mitchell Felt, president of Graham-Paige, said the company contemplates no change in policies or operations.

United's plant in Tulsa manufactures pumping units and engine starters. Branch offices are located at New Orleans and Shreveport, La.; Hobbs, N. M.; and Houston, Dallas, and Midland, Tex. Its stores are at Great Bend and Wichita, Kans.; Eunice, Homer, New Iberia, and Harvey, La.; Eunice and Lovington, N. M.; Ardmore, Oklahoma City, Pauls Valley, Seminole, Velma, and Lindsay, Okla.; and Alice, Andrews, Denver City, Edna, Houston, Kermit, Odessa, and Snyder, Tex.

Scott Made Assistant to Byron Jackson President

PHILIP SCOTT

Philip W. Scott has been named to the special post of assistant to the president of the Byron Jackson division of Borg-Warner Corp. This announcement was made by E. S. Dulin, president of the division. Scott has been an executive in Borg-Warner's headquarters at Chicago and had an important part in negotiating the recent merger between Byron Jackson and Borg-Warner.

In announcing the new assignment, Dulin said, "I personally requested that Scott be selected for this responsibility. He will work with me on all phases of management operations and the analysis and development of plans and policies that we will use at Byron Jackson to coordinate with the Borg-Warner program for growth."

Alten Holds Semiannual Sales Meeting

The sales personnel and field engineers associated with the petroleum-equipment division of Alten Foundry & Machine Works assembled at the company's executive offices in Lancaster, Ohio, recently for the regular semiannual sales meet. New pumping unit models were shown for the first time, and new features were introduced. Attending were, front row: Lloyd Morgan, Gulf Coast territory; Don Griggs, eastern territory; Fred R. Bayne, chief engineer; Warren M. Benson, vice president; Robert McCauley, sales office; Ralph Griffin, Illinois-Indiana territory; Doyle Gardner, sales office. Back row: Lon Belcher, Oklahoma territory; Roy Longnecker, sales promotion manager; R. R. Matthews, division sales manager; Bob Ledeker, Kansas territory; Earl Brooks, manager sales office; Bill Hudson, North Texas territory; William Morris, assistant chief engineer.

Lane-Wells Reassigns Key Executive Officials

In a general reassignment of administrative duties, John J. Neale, president of Lane-Wells Co., one of the Dresser

JOHN J. NEALE

J. D. HUGHES

Industries, announced that effective November 1, 1955, James D. Hughes, formerly vice president, sales, will now direct the sales and service activities of the company.

K. H. Miner, formerly vice president of Petro-Tech Service Co., is assuming an assignment as acting manager, engineering, manufacturing, and purchasing. R. M. Otis continues as vice president, research and patents.

John C. Stick, Jr., formerly the company's chief geophysical engineer, has been appointed chief engineer in the absence of V. L. Forsyth, who is temporarily on special assignment as administrative assistant to the president. J. Shannon Baker has assumed the duties of the chief geophysical engineer.

R. W. Keener, formerly vice president of Petro-Tech Service Co., a Lane-Wells foreign subsidiary, was named manager, foreign sales and service. J. M. Henderson, Gulf Coast division manager, has been promoted to manager, sales and service for the company, and R. E. Bush has been advanced to manager of the Gulf Coast division.

Ethyl's Houston Testing Laboratory in Operation

Ethyl Corp. has officially placed in operation its newly completed Houston gasoline-testing laboratory.

The new laboratory, which is part of Ethyl's nationwide gasoline-testing service to the oil industry, will utilize the latest equipment and methods for the precise measurement of gasoline characteristics. It will offer "same day" service on test results to refiners throughout the Southwest. Tucker E. Dawson is manager of the laboratory.

A group of Ethyl's executives spon-

sored an open house celebration at the laboratory to mark this latest expansion of the company's gasoline-testing service, first established in the 1920's. Representatives of numerous oil companies attended and inspected the new facilities.

The new laboratory will also house Ethyl's Houston district office. All of the Ethyl field services to refiners in the adjoining area will be coordinated by the district office, and educational materials and demonstration equipment will be available from it.

Well Surveys Tests Smallest Atom Smasher

Radioactivity well logging was pushed several strides closer to positive identification and location of oil-bearing formations recently by the first successful test of the world's smallest "atom smasher" by Well Surveys, Inc., Tulsa, an affiliate of Lane-Wells Co., one of the Dresser Industries. The company is manufacturing a unique new neutron generator-detector incorporated in a well-logging assembly only 3⅝ in. in diameter.

The "baby" accelerator was developed and constructed for Well Surveys High Voltage Engineering Corp., Cambridge, Mass.

Some of the Well Surveys, Inc. and High Voltage Engineering Corp. personnel that worked on the new instrument are, Back row: A. T. Norton, Ralph Monaghan, Richard Connor, Billy Wilson, Arthur Youmans. Front row: Troy Barnes, Tell Henrichs, Eric Hopkinson, James Cooley, and Thomas P. Hubbard.

R. F. Lay Elected Vice President, Cooper-Bessemer

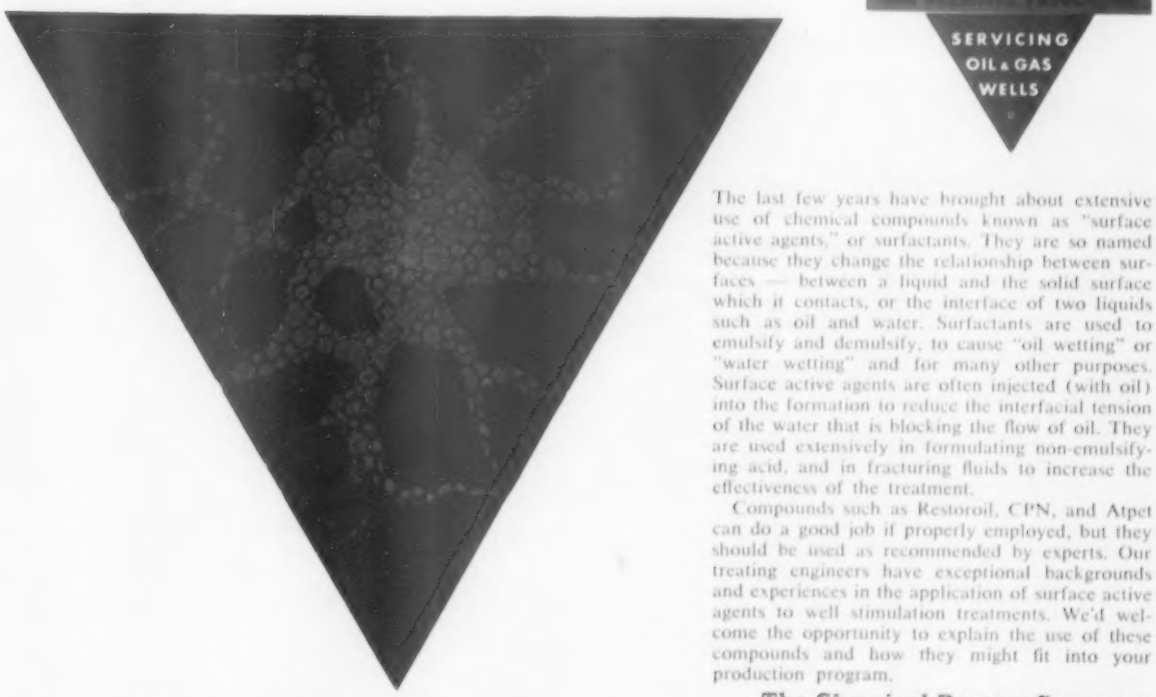
R. F. LAY

By the action of its board of directors, Robert F. Lay has been elected vice president and general sales manager. This announcement was made by Stanley E. Johnson, vice president and director of Cooper-Bessemer Corp., Mount Vernon, Ohio.

The election of Lay as an officer of the company landmarks a period of service as general sales manager for the company products, including engine-driven and motor-driven compressors, gas engines, diesel engines, and gas-diesel engines.

First associated with Cooper-Bessemer in 1924 as a co-op student, Lay later joined Baldwin Locomotive Co. to become its assistant sales manager. He later affiliated with Elliott Co. as sales engineer, ultimately becoming chief engineer of the supercharging division and then production manager.

Upon return to Cooper-Bessemer in 1946, Lay served as head of the stationary application engineering section



The last few years have brought about extensive use of chemical compounds known as "surface active agents," or surfactants. They are so named because they change the relationship between surfaces — between a liquid and the solid surface which it contacts, or the interface of two liquids such as oil and water. Surfactants are used to emulsify and demulsify, to cause "oil wetting" or "water wetting" and for many other purposes. Surface active agents are often injected (with oil) into the formation to reduce the interfacial tension of the water that is blocking the flow of oil. They are used extensively in formulating non-emulsifying acid, and in fracturing fluids to increase the effectiveness of the treatment.

Compounds such as Restoroil, CPN, and Atpet can do a good job if properly employed, but they should be used as recommended by experts. Our treating engineers have exceptional backgrounds and experiences in the application of surface active agents to well stimulation treatments. We'd welcome the opportunity to explain the use of these compounds and how they might fit into your production program.

The Chemical Process Company

Surface Active Agents

and later as chief engineer, products division.

About a year and a half ago, Lay became assistant sales manager for all Cooper - Bessemer's products and was named sales manager the first of this year.

Ciapetta Heads Davison Catalyst Research

Dr. Frank G. Ciapetta has been named director of catalyst research, Davison Chemical Co., division of W. R. Grace & Co. He has been in charge of catalytic research for Socony Mobil Oil Co., Inc., at Paulsboro, N. J.

Ciapetta joined the research and development department of the Atlantic Refining Co. in 1939 and was principal chemist in charge of the catalytic-process group at Atlantic in 1951 when he joined Socony.

In addition to being the author of numerous technical papers, mainly in petroleum chemistry and the application of heterogeneous catalysis in this field, Dr. Ciapetta has been issued seven patents on new processes related to the production of gasoline. His research in naphtha-reforming catalysis contributed to one of the major refining processes. He received the 1955 Precision Scientific Co. award in petroleum chemistry for his contributions to the field of catalysis and to the petroleum industry.

Phillips Builds Sales, Service Laboratory

A new sales-service laboratory is under construction by Phillips Chemical Co. adjacent to the large chemical-research laboratories being built by its parent company, Phillips Petroleum Co., at the Phillips Research Center, Bartlesville, Okla. The structure will provide space for a wide variety of services and facilities required as a result of Phillips' development of its new thermoplastic material, trademarked Marlex 50.

This ethylene polymer, which will become commercially available in 1956 upon completion of the first unit of a manufacturing plant now under construction at the company's Adams Terminal facilities on the Houston Ship Channel, has aroused much scientific and economic interest in the plastics and allied industries.

In addition to service engineers' offices and conference space, the laboratory will have complete facilities

Phillips Chemical Co.'s new sales-service laboratory at the Phillips Research Center at Bartlesville, Okla., will be completely equipped for customer service in evaluating, converting, and fabricating plastics.

The hand-applied tool joint with

"4 POINT SEAL" Protection

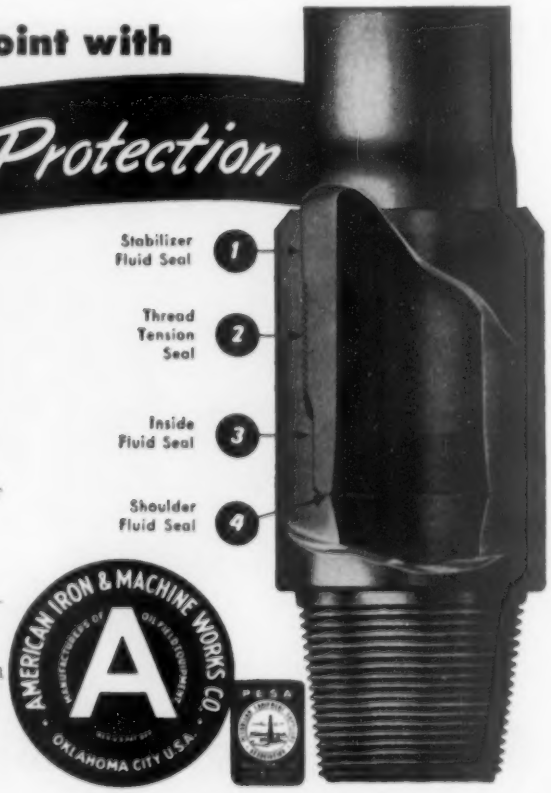
AMERICAN

Straight Grip

TOOL JOINT

In areas where tool joints must be replaced before the drill pipe is retired—or where tool joints outlast the drill pipe, American Iron hand-applied Straight Grip tool joints offer your best investment.

Precision machining and accurate gaging guarantee the perfect 4-POINT SEAL PROTECTION against joint leakage and creep—these seals actually become tighter as pump pressures increase. When replacement of Straight Grip tool joints is necessary, the worn ones are removed and new ones applied right at your rig!



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Adequate barite and bentonite reserves have become invaluable to the future of the oil industry. And locating and maintaining these high quality raw material deposits is just like finding new oil reserves: you have to go out and look for them years ahead to insure a dependable supply in the future.
Magcobar maintains a geological staff that has located the highest quality raw material deposits in the Western hemisphere. And the search continues day after day so that the oil industry can be assured of adequate drilling mud stocks in the future . . . from Magcobar.
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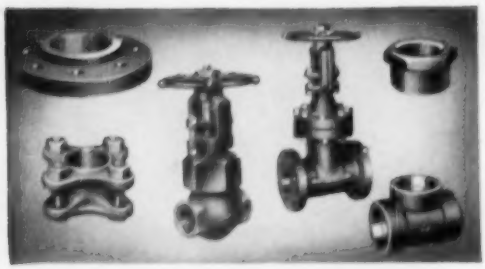
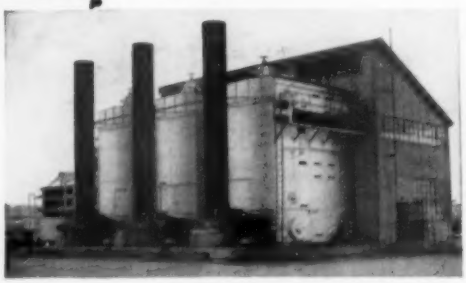
Complete
DRILLING MUD SERVICE

Designed for today's *Tough* service demands



DROP FORGED VALVES AND FITTINGS FOR TOUGHNESS AND TROUBLE-FREE SERVICE

Drop forged from carbon and alloy steels, Vogt valves, fittings and flanges will safely handle liquids and gases at high pressures and high temperatures in power plants, chemical plants, petroleum refineries, etc. The complete line includes flanged, screwed and socket weld end globe, gate and check valves—ells, tees, and crosses—couplings—bushings—plugs—unions—flanges and flange unions—and welding heads.



MODERN STEAM GENERATORS

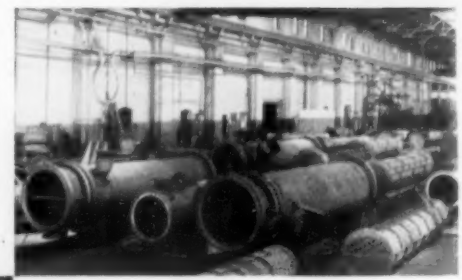
Vogt steam generators are designed to give maximum rating in a minimum of space, with high efficiency and low maintenance expense. Bent tube types and straight tube, forged steel sectional header types to burn solid, liquid or gaseous fuels meet every power, process or heating requirement.

PROCESS EQUIPMENT FOR EVERY SERVICE

Vogt constructs process equipment in wide variety to all Codes. Stills and towers, oil chillers, crystallizers, heat exchangers, molding machines, etc., serve in the manufacture of oils, greases, 100 octane gasoline, synthetic rubber, chemicals and related products around the world.

SPECIAL MATERIALS COMBAT CORROSION AND PRODUCT CONTAMINATION

Our modern shops produce a wide variety of equipment from special metals and alloys to fight corrosion and product discoloration or contamination. Fabrication procedures insure that corrosion resistant properties of welds will match that of the materials used to construct the equipment.



MORE REFRIGERATION TONNAGE AT LESS COST

More than 70 years of engineering and manufacturing experience is incorporated in Vogt refrigerating and ice making equipment. Absorption Systems, Compression Systems, and Tube-Ice Machines in a wide range of capacities serve industrial and processing plants, and institutions, here and abroad.

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FOR REFINERIES, CHEMICAL PLANTS POWER PLANTS AND PROCESS INDUSTRIES

HENRY VOGT MACHINE CO.
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for physical, chemical, and electrical testing; extensive molding, extrusion, and converting equipment so that any field of plastics, such as film, fiber, pipe, wire and cable, structural, and other applications, may be demonstrated on a basis typical of commercial production.

Republic Supply Opens Store at Pawhuska

Republic Supply Co. has opened a new store at Pawhuska, Okla., according to an announcement by M. N. Amsden, vice president and general sales manager.

Richard Wells is store manager. Pete Bergin and Harold Smith are field salesmen, and J. P. Rhodes is district manager for the area.

Gunn to Manage Dow's Los Angeles Office

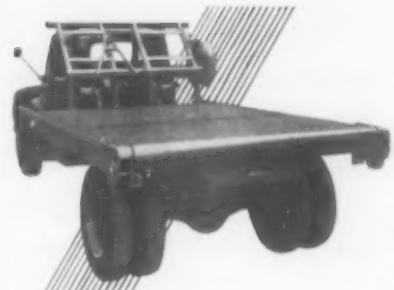
The advancement of Floyd J. Gunn to manager of Dow Chemical Co.'s Los Angeles office has been announced by Donald Williams, vice president and director of sales. Gunn has served as manager of coatings sales for the company's plastics department for the past 6 years.

He succeeds Homer L. White who has held the post since 1950 and will now take over an assignment on the company's production-control staff in Midland.

The Los Angeles office services a growing market area which includes southern California, Arizona, and the southern tip of Nevada. It handles all Dow product groups, industrial and fine chemicals, plastics, and magnesium.

Macco Moves to New Headquarters Building

As a result of an expansion program announced last year, Macco Oil Tool Co., Inc. recently moved its main offices into a new building at Houston. The new building houses the executive and general offices. Location of the new building is adjacent to the manufacturing plant. Macco manufactures a complete line of gas-lift valves and has sales offices located throughout the Gulf Coast of Texas, Louisiana, and the Permian basin. Macco is represented in California by the Emsco Manufacturing Co., D & B division.



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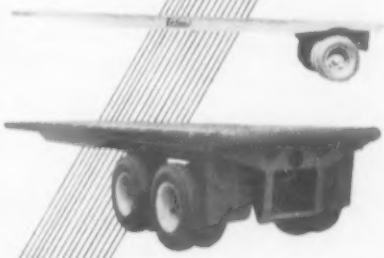
"PACKAGED UNIT"

The work-horse in any job . . . ideal for winching . . . hauling . . . towing . . . gin pole work (single or double). Acknowledged by users in drilling, pipeline and construction as the most durable in fabrication . . . the most advanced in design of any utility body on the market today.

LELAND
POLE TRAILERS

Oil companies, pipeline contractors, lumber operators, haulers and utility companies all report superior performance from Leland's pole trailers. Engineered in both single and tandem axle, the trailer can be equipped with air, vacuum or electric brakes depending on your power equipment. Simplicity of design delivers maximum pay loads at minimum initial and maintenance cost.

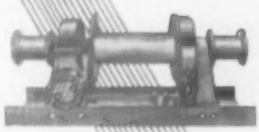


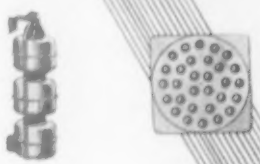
LELAND
SELF-LOADING FLOATS

With both the single and tandem axle self-loading floats, a single man can load and move the heaviest equipment or machinery. Many of the advanced design features of the famed Leland Packaged Unit have been carried over into the Leland float line. In addition to its standard models, Leland fabricates these floats to meet your specific load requirements.

PLUS A COMPLETE LINE OF
TRUCK EQUIPMENT

You should also investigate Leland's unique fifth wheel truck body . . . Heil Dump Bodies . . . Dorsey Low Bed Trailers . . . McCabe-Powers Service Bodies . . . Knapheide Platform Bodies and Tulsa Winches. No stock in the southwest is better for miscellaneous equipment such as flares, reflectors, repair equipment, etc. No wonder that when contractors think of trucks and truck equipment . . . THEY THINK OF





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EQUIPMENT COMPANY
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We Said: **DRISCOSE** *would help keep your mud fluid in hot holes.*

We Said: **DRISCOSE** *would help improve your electric logs.*

We Said: **DRISCOSE** *would help increase your drilling rate.*

NOW LET DRISCOSE* PROVE IT TO YOU!

The replacement of many of the fine ground drill cuttings in a mud with a small amount of DRISCOSE is known as controlling solids. Drilling and completing with a controlled-solids mud reduces the need for certain treating chemicals which, along with undesirable drill cuttings, contribute to solidifying of mud in the presence of high formation temperatures.

These treating chemicals, acting as electrolytes, also alter the resistivity of mud so that S. P. curves become distorted. The reduction of solids with DRISCOSE also decreases friction on the drill stem, thus permitting faster drilling. Our expert technical assistance is available on your specific mud problems. Order DRISCOSE through your regular mud dealer.

DRILL WITH

DRISCOSE*

DRILLING SPECIALTIES COMPANY BARTLESVILLE, OKLAHOMA

*DRISCOSE is a trademark for Sodium Carboxymethylcellulose.

EXPLORATION

Cambrian Pools Are Many-Splendored Things

by Frank J. Gardner

ONLY 2½ years ago, there were no wells in West Central Texas that produced oil from the Cambrian. Today, there are about 100 Cambrian producers. Most are flowing wells yielding an average 100 bbl. per day. All lie along a narrow 45-mile "Cambrian trend," in six small fields in Coke and Nolan counties. There have been no new Cambrian strikes since early 1954. Geology of the six fields is very similar and they seem to fall into a definite structural pattern. Largest of the fields is White Flat, in northeastern Nolan County, with 53 wells producing about 68,000 bbl. of high-gravity (40°) oil per month. It is the northernmost field along the trend. During 1955, the Cambrian "play" had become almost a memory.

Those are the facts about the Cambrian in Texas. Up until last week, that is. Then, American Liberty Oil Co. 2 Shadle, drilling on the west side of the newly discovered Schick (Bend-Pennsylvanian) field in central Stonewall County, reported recovery of 2,320 ft. of free oil from the Wilberns-Cambrian section at 6,098-6,113 ft. A potential of 720 bbl. per day was estimated.

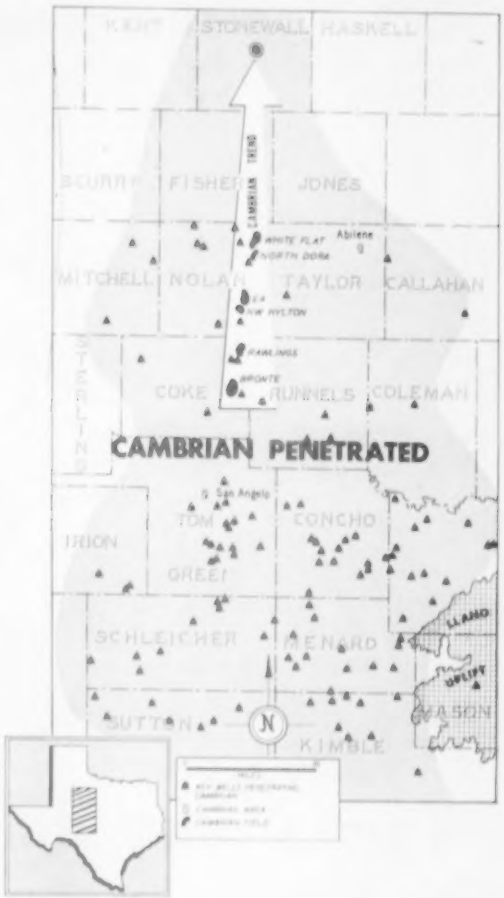
The facts change . . . The facts changed and fast. Suddenly, the Cambrian trend of Texas was 95 miles long instead of 45. Suddenly, there's a rally, and the fading Cambrian play is the hottest thing in West Texas. Leases through Fisher and Stonewall counties take on a new glitter as prices zoom upward.

Why? Simply because Cambrian reservoirs are about the best thing an operator can hope for. Thick pay sections, good porosities, good permeabilities, high potentials (up to 2,300 bbl. daily), good quality oil, high reserve figures, and fairly shallow drilling (5,300 to 6,000 ft.).

But there's a catch. The pools are hard to find. The typical Cambrian structure is masked by pre-Pennsylvanian unconformities, making it most elusive to the geophysicist. Typically, it is elongated north-south, exhibits 150 to 1,000 ft. of closure, is faulted along its eastern flank (upthrown to the west), has been deeply eroded at its crest in pre-Pennsylvanian time with consequent removal of all or part of the overlying Ellenburger, and, because of post-Pennsylvanian compaction or folding, or both, offers as many as six potential pay horizons above the Cambrian. The structural relief decreases gradually upward in the section. In the Permian it may be only 30 ft.

As the search improves . . . The Cambrian prospect is best found by core drilling to shallow Permian markers or by closely concentrated seismic shooting for these markers. The Cretaceous cover and the subsurface unconformities in the region have hampered geophysical search for structure here, but new shooting methods will improve results.

It is too early, of course, to know the situation at Schick, but developments so far follow a pattern set by other Cambrian discoveries. Operators report a complete absence of Ellenburger and Bend-Pennsylvanian conglomerate. Previous wells at Schick have produced from a Bend conglomerate at the 6,100-ft. level; they lie east of the Cambrian discovery. American Liberty 1 Shadle, an east offset to the new strike, found some water-bearing Ellenburger and completed in the Bend conglomerate. Operators now have staked a west offset, the 3 Shadle, and will probe the Cambrian in hopes of finding a thicker pay section than at 2 Shadle. One of two things may happen: the west offset will (1) find a thicker Cambrian section and probably make a better well, or (2) find the Cambrian missing on the crest of a "bald" anticline. The outcome depends, of course, on structural position. If the second condition occurs, a halo of Cambrian sand may be indicated, in which case still further westward drilling might again tap the Cambrian reservoir. This was found in at least one field along the trend.



Texas' Cambrian Trend has leaped 50 miles northward with discovery of Wilberns oil in central Stonewall County. Discovery was made by American Liberty Oil Co. at its 2 Shadle.

For premium pools . . . These, then are the facts to date. The discovery has spurred the lagging Cambrian search. Further success along the trend may encourage operators to undertake a more vigorous campaign not only between the Stonewall strike and White Flat field, but far to the south, in Tom Green, Schleicher, and Sutton counties. The search will tax the best geologist and the most patient geophysicist, but the reward, a flush field with good recovery from shallow depths, is certainly worth the effort. Cambrian pools are premium pools, and "you just can't hardly find 'em like that no more!"

Two Areas Share October Limelight

Nebraska and California in dead heat for leading role, but Texas, Gulf Coast, and Mid-Continent provide a good supporting cast

by John C. McCaslin

OCTOBER exploratory success paved the way for future prospects in two new regions, Nebraska's Cambridge arch and Santa Cruz Mountains. Despite the small potentials of the two discovery wells in these regions, they rate high on the list of interesting and significant developments.

There were some big producers and important developments on the remainder of the October exploratory calendar. Texas wildcatters were well rewarded for their efforts, particularly in West and Southwest Texas. News makers in the Gulf Coast province were along the Louisiana coastal marshes. The search for Lower Cretaceous production in Mississippi continued unabated with one new field uncovered. Exploration in the Mid-Continent province met with greatest success at West Short Junction and Greenville in Oklahoma. South Dakota, Arizona, and Ohio made their first appearance on the 1955 exploratory stage.

The Cambridge Arch

The Cambridge arch of southwestern Nebraska and northwestern Kansas added its second producing area at Jones, Shelburne & Farmer 1 Fritz, a Hitchcock County, Nebraska, wildcat, 8 miles west of McCook. The well was put on pump after swabbing 7 bbl. of oil per hour from the Pennsylvanian.

Location of this important discovery is near the Cambrian pinchout on the Cambridge arch, about 50 miles northwest of the structure's only other pool, Norton, in Norton County, Kansas. Nearest Nebraska production is about 100 miles northwest in the Denver-Julesburg basin. There has been considerable drilling along the Chadron and Cambridge arches in recent months, but the Hitchcock County well offers the first solid evidence of productive possibilities on the Nebraska side of the Cambridge arch.

Union Oil Co. of California recorded what is perhaps the most interesting strike of the year on the Pacific Coast. After considerable difficulty, Union completed the 1 Richfield-Costa in San Mateo County's rugged Santa Cruz Mountains for 30 bbl. of oil on the first 19 hours of production. The perforated interval was 2,060-2,160 ft. in the Butano sand of Oligocene.

The discovery well is 9 miles southeast of Lahonda and 14 miles south of Palo Alto in northern California. First reports of the wildcat's success touched off a leasing spree despite at least six previous dry holes by other companies in the mountainous region. Nearest production to the well is Sargent field, 75 miles south.

Sacramento Valley . . . The northern California gas search continued with two companies announcing wildcat sites in Colusa and Yolo counties. Honolulu Oil Corp. will drill 1 mile southeast of its Princeton-South field dis-

Total October Completions, Exploration, and Development

	Total completions					Total wildcat wells					Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage	
Alabama	1	1	0	0	11,517	1	1	0	0	11,517	11
Arkansas	66	33	1	32	201,921	15	3	1	11	48,917	65
California	196	125	4	67	938,553	51	4	0	47	293,329	246
Colorado	153	34	12	107	819,095	71	3	0	68	388,247	129
Florida	3	0	0	3	25,886	3	0	0	3	25,886	2
Illinois	321	147	3	171	767,395	61	8	0	53	136,807	531
Indiana	45	18	2	25	82,190	13	1	0	12	25,588	69
Kansas	381	167	30	184	1,373,199	79	6	2	71	309,090	430
Kentucky	149	79	8	62	189,310	34	5	0	29	49,198	189
Louisiana	353	200	27	126	2,573,785	68	18	7	43	669,002	459
North	155	94	16	45	547,312	23	5	2	16	152,952	177
South	198	106	11	81	2,026,473	45	13	5	27	516,050	282
Michigan	47	19	1	27	139,018	19	1	0	18	58,225	116
Mississippi	43	13	0	30	313,896	21	0	0	21	151,109	41
Montana	63	16	4	43	256,763	36	2	1	33	140,575	88
Nebraska	113	30	1	82	621,002	55	4	1	50	281,965	74
New Mexico	139	67	59	13	572,734	5	3	0	2	25,157	194
Northwest	60	1	58	1	207,117	1	1	0	0	6,509	69
Southeast	79	66	1	12	365,617	4	2	0	2	18,648	125
New York	20	10	0	10	28,000	0	0	0	0	0	14
North Dakota	28	18	0	10	189,132	11	2	0	9	60,646	35
Ohio	104	60	16	28	196,990	1	1	0	0	3,365	211
Oklahoma	567	357	19	191	1,884,701	57	9	3	45	259,721	1,127
Pennsylvania	69	22	23	24	167,318	1	0	0	1	7,620	48
South Dakota	7	1	0	6	17,858	7	1	0	6	17,858	15
Texas	1,561	989	48	524	6,797,863	403	69	7	327	2,008,940	1,331
North Central (7-B & 9)	483	262	5	216	1,587,945	133	21	1	111	515,760	313
West (7-C & 8)	398	350	1	47	2,030,295	62	19	0	43	354,401	474
Panhandle (10)	86	71	6	9	298,658	4	1	0	3	29,583	52
East (5 & 6)	81	38	2	41	366,106	29	1	0	28	143,605	96
Gulf Coast (2 & 3)	236	117	21	98	1,487,043	83	14	3	66	580,459	206
Southwest (1 & 4)	277	151	13	113	1,027,816	92	13	3	76	385,132	190
Utah	9	1	2	6	31,339	6	0	2	4	21,689	33
West Virginia	66	4	53	9	187,404	6	0	1	5	23,162	143
Wyoming	135	62	8	65	561,636	41	6	1	34	189,064	206
Miscellaneous	§9	0	0	9	29,584	9	0	0	9	29,584	¶5
Total October 1955	4,648	†2,473	321	*1,854	18,978,089	1,074	‡147	26	901	5,236,261	5,812
Total September 1955	5,055	2,746	326	1,983	20,152,624	1,108	161	32	915	5,163,638	5,699
Cumulative 1955	47,229	26,457	2,947	17,825	188,661,033	10,223	1,536	298	8,389	49,080,857	
Cumulative 1954	44,459	24,651	3,294	16,514	181,142,514	9,138	1,287	321	7,530	44,548,473	
Western Canada	331	231	20	80	1,446,930	78	11	15	52	361,179	
Alberta	185	135	18	32	958,868	41	8	14	19	209,323	
Saskatchewan	106	62	1	43	394,044	34	3	0	31	138,672	
Manitoba	39	34	0	5	88,894	2	0	0	2	8,060	
B.C.-N.W.T.	1	0	1	0	5,124	1	0	1	0	5,124	
Cumulative 1955	2,417	1,687	127	603	10,629,872	635	115	69	451	3,141,445	

Incl. 62 service wells: Calif. 1, Kans. 2, N. Y. 8, Ohio 3, Okla. 36, Pa. 12. †Incl. 55 cond. wells: N. La. 5, S. La. 12, Miss. 3, Okla. 9, Tex. Panhandle 1, Gulf Coast 15, S.W. Tex. 10. ‡Incl. 21 cond. discoveries: N. La. 4, S. La. 3, Okla. 1, Tex. Panhandle 1, Gulf Coast 8, S.W. Tex. 4. §Incl. Ga. 1 dry, 4,100 ft.; Idaho 4 dry, 11,546 ft.; Nev. 3 dry, 9,226 ft.; Wash. 1 dry, 4,712 ft. ¶Incl. Ga. 1, Nev. 1, Wash. 3.

covery well. Signal Oil & Gas Co. will drill a test in Yolo County's Sycamore Slough area.

Regional Summary

Texas . . . The Devonian, Mississippian, and lower Cretaceous dominated exploration in the Lone Star State.

. . . Martin County. Pan American Production Co. 1 Shook, in northwestern Martin County, was credited with flowing oil at the rate of 1,200 bbl. per day on initial tests of the Devonian. This discovery is 2 miles northeast of similar Devonian production in Breedlove field. Block 7 Devonian field is southwest.

. . . Gaines County. The first big Mississippian oil producer in West Texas was completed at a rank wildcat location in the northeastern part of the county. Felmont Oil Corp. 1 Oil Development Co. flowed 1,521 bbl. of oil daily from the Mississippian pay. Mississippian limestones produce well in west-central counties, but production in West Texas so far has been small.

. . . Balcones region. Intense interest is building up along the southwestern end of the Balcones fault zone this year in Southwest Texas. The latest impetus to this promising campaign for Lower Cretaceous production is at Producers Corp. of Nevada and Henderson Coquat's Edwards lime gas prospect near Tilden in central McMullen County. Drill-stem tests of the Edwards show good prospects of a discovery.

The old Leona River gas area in southeastern Zavala County is being revived by an extension producer completed at Pronto-Andrews 2 West, 5,900 ft. of production. The revival well flowed 13,000 M.c.f. of gas per day from the Olmos (Navarro-Upper Cretaceous) sand. The area is from 16-18 miles southeast of Batesville, near the Frio County line. It is at the southwest end of a producing trend extending southwestward from Charlotte-Crown of northwest Atascosa County, across Frio through Pearsall field, and into Zapata County.

Mid-Continent . . . West Short Junction field in Cleveland County continues to be the focal point of Oklahoma development interest. The Hunton lime reservoir received its fortieth oil well during the month. One north extension flowed more than 1,000 bbl. per day, adding several thousand more productive acres to the fast-growing field.

. . . Greenville. One of the most significant strikes of the year for Oklahoma is Frankfort Oil Co. 1 Gardner at the southeast end of a 30-mile string of Pennsylvanian, Hunton, Bromide,

Total Depth Classifications, October 1955

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	0	0	0	0	1	0	0
Arkansas	0	23	27	9	7	0	0	0	0
California	17	37	35	29	45	19	10	3	1
Colorado	3	3	5	33	104	5	0	0	0
Florida	0	0	0	1	0	0	2	0	0
Illinois	32	114	175	0	0	0	0	0	0
Indiana	11	23	11	0	0	0	0	0	0
Kansas	2	33	186	140	20	0	0	0	0
Kentucky	103	36	6	3	1	0	0	0	0
Louisiana	7	80	25	12	45	76	67	34	7
North	7	79	21	5	28	7	8	0	0
South	0	1	4	7	17	69	59	34	7
Michigan	3	17	9	15	3	0	0	0	0
Mississippi	0	1	0	5	20	11	3	3	0
Montana	0	12	30	5	10	6	0	0	0
Nebraska	0	1	10	18	84	0	0	0	0
New Mexico	5	12	62	23	6	25	5	1	0
Northwest	0	0	25	9	1	24	1	0	0
Southeast	5	12	37	14	5	1	4	1	0
New York	0	20	0	0	0	0	0	0	0
North Dakota	0	0	6	2	5	14	1	0	0
Ohio	40	15	49	0	0	0	0	0	0
Oklahoma	82	182	136	63	52	42	9	1	0
Pennsylvania	1	41	12	1	14	0	0	0	0
South Dakota	0	2	5	0	0	0	0	0	0
Texas	120	327	313	259	327	155	39	20	1
North Central	50	197	59	87	77	13	0	0	0
West	20	25	99	44	93	42	16	19	0
Panhandle	0	4	73	2	3	4	0	0	0
East	7	14	10	15	33	1	1	0	0
Gulf Coast	12	10	19	30	71	76	16	1	1
Southwest	31	77	53	41	50	19	6	0	0
Utah	1	4	0	0	4	0	0	0	0
West Virginia	2	30	14	18	2	0	0	0	0
Wyoming	18	17	31	23	31	13	2	0	0
Miscellaneous	0	2	3	4	0	0	0	0	0
Total October 1955	447	1,032	1,150	663	780	366	139	62	9
Total September 1955	464	1,168	1,436	705	742	339	130	63	8
Cumulative 1955	4,234	11,320	12,319	6,723	7,295	3,316	1,368	572	82
Western Canada	0	69	58	87	91	24	2	0	0
Alberta	0	22	14	40	83	24	2	0	0
Saskatchewan	0	15	39	45	7	0	0	0	0
Manitoba	0	32	5	2	0	0	0	0	0
B.C.-N.W.T.	0	0	0	0	1	0	0	0	0
Cumulative 1955	11	442	559	558	691	123	31	2	0

and Arbuckle discoveries extending from Healdton to North Marietta. The Frankfort discovery, located in Love County, flowed oil at the rate of 35 bbl. per hour from more than 100 ft. of effective pay zone in the Joins (Simpson group-Ordovician).

Gulf Coast . . . Oil and gas-condensate discoveries along the Louisiana coastal marshes led the discovery pace in this province.

. . . Acadia. A major oil discovery for the coastal region was made by Humble Oil & Refining Co. in the Bayou Wickoff area, 2½ miles northeast of Crowley.

The 1-B Habetz flowed at the rate of 740 bbl. of oil daily from a 50-ft. sand section of the Frio. The sand tested at this discovery is nearly 1,000 ft. deeper than the deepest producing zone at either North Crowley or Crowley fields nearby.

. . . Cameron. Fifteen Oil Co. made a deep gas-condensate discovery in Cameron Parish's Second Bayou area, 1½ miles northeast of Crab Lake field and 2 miles southwest of Grand Chenier field. Both of these latter fields are deep gas-condensate areas.

Southeastern States . . . The stock of the Lower Cretaceous rose in Mississippi with an indicated Rodessa sand oil discovery in southeastern Smith County.

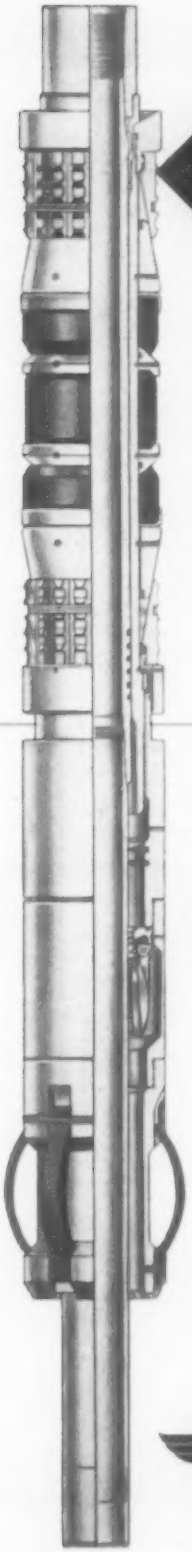
The 1 Johnson et al., operated by The California Co., has good prospects of becoming another in the slowly growing chain of Lower Cretaceous fields stretching from Bolton, west of Jackson, to new Citronelle field in southwestern Alabama.

Exploratory newcomers . . . Three states, Arizona, South Dakota, and Ohio, edged into the exploratory news last month.

Helms 1 Coffing in Custer County is the discovery well of South Dakota's second oil field. The well was officially completed for 80 bbl. of oil per day, flowing from the first Leo sand of basal Pennsylvanian age. The discovery is located in the southwestern part of the state, just south of the Black Hills in the extreme eastern brink of the Powder River basin of Wyoming fame.

Humble gave Arizona its first oil well at the 1 Navajo in the East Boundary Butte area of Apache County. The well, located in the northeastern corner of the state, flowed 65 bbl. of oil per day from the Pennsylvanian. This discovery is ¾ mile southwest of the gas well that gave the state its first production.

The area around Layland, on the Coshocton-Holmes County line in Ohio, is getting a big play this year. There are 20 rigs running in this busy area. More than 100 wells a month are being completed in Ohio, and the dry-hole ratio is only 26 per cent. Production of crude oil is on the rise, probably due to fracturing. Daily crude runs are nearing 12,000 bbl. per day.



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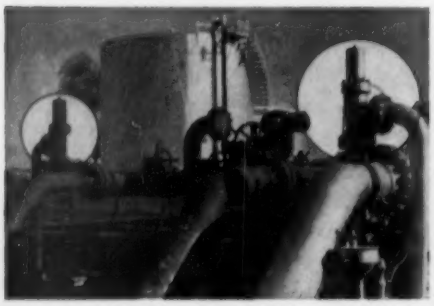

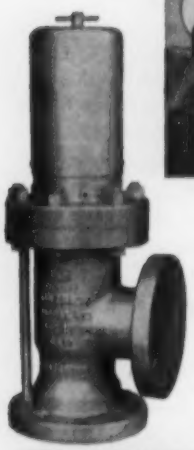

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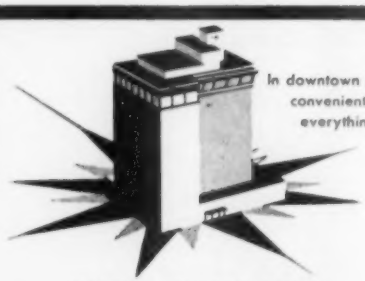

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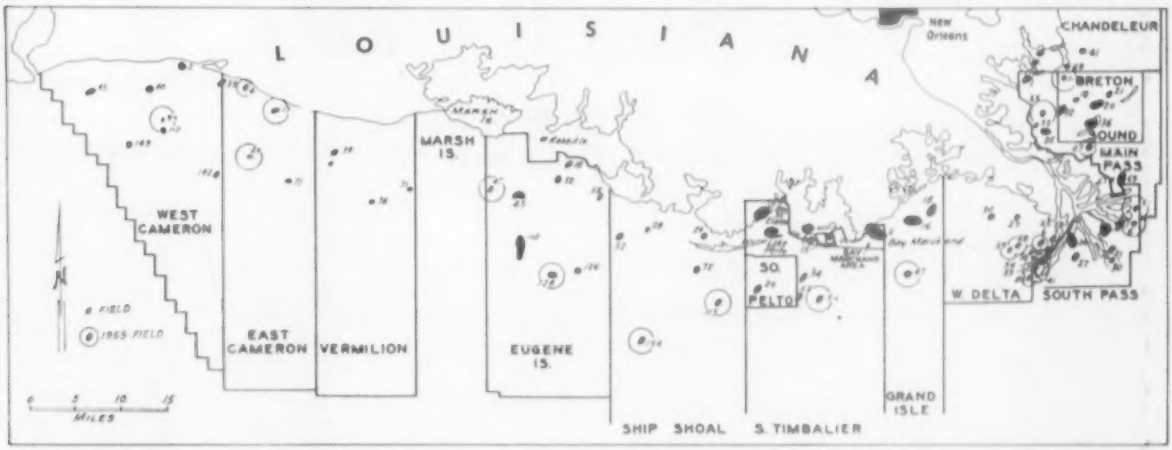

The industry has opened 23 new fields in the Gulf of Mexico off Louisiana this year. 1955 discoveries are circled.

Here's Louisiana Offshore Tally for 1955

Neil Williams

SPREADING exploration on Louisiana's Continental Shelf Areas this year, with more than a month to go, has uncovered 23 new oil and gas fields. These are exclusive of the additional reservoirs and multiple productive horizons proved in these and previously discovered fields. Seven of this year's discoveries have been confirmed, six of them with additional pay zones.

This year's new discoveries have boosted to 72 the total number of Louisiana's offshore fields, spread from the state's western extremity off the coast of Cameron Parish, around the Mississippi River delta area, and into the Breton Sound and Chandeleur Sound areas off the state's southeastern shore.

Discovery wells this year represent nearly 42 per cent of the tests drilled on wildcat blocks, a success ratio of nearly 1 well to 1½ tests drilled. Twelve new fields proved productive of oil; seven others were gas-condensate reservoirs. The four remaining got dry gas.

Altogether, more than 260 wells have been drilled this year on Louisiana's Continental Shelf. And, of the more than 200 wells drilled in and around known field areas, proved productive. Successful wells in these areas represented more than 76 per cent of total wells drilled.

Currently, there are 47 active drilling operations. Thirty-two of these are in known field areas, and 15 on the wildcat blocks.

1955 LOUISIANA OFFSHORE NEW-FIELD DISCOVERIES

Area and discovery company—	Block	Disc. date, mo.-day	Prod.	Prod. interval (ft.)	Total depth (ft.)	Additional tests Comp.	Drlg.
West Cameron:							
Pure	99	7-20	Dry gas	1,707-09	12,900	0	0
East Cameron:							
Forest	4	8-31	Gas-cond.	13,111-21	14,548	0	0
Shell	17	3-16	Gas-cond.	11,956-66	13,719	[3]	0
Continental	49	9- 5	Gas-cond.	11,090-97	11,896	0	0
Eugene Island:							
Pure	47	3-15	Gas-cond.	8,483-87	11,362	[9]1	0
Magnolia	128	6-10	Oil	9,364-9,516 10,110-30	11,029	[3]1	1
Ship Shoal:							
Magnolia	113	7-28	Oil	7,446-52 7,529-38	11,407	1	1
Gulf	154	8- 8	Oil	6,196-6,222	6,919	[4]2	0
South Timbalier:							
Sinclair	15	6-26	Gas-cond.	11,986-96	13,756	[5]1	0
Humble	54	5-30	Oil	6,591-6,605	11,831	[5]1	1
Grand Isle:							
Continental	47	(7)	Oil		15,058	0	0
West Delta:							
Continental	55	9-24	Dry gas	4,844-52	14,030	0	0
Continental	56	5- 9	Gas	4,361-68	12,898	0	0
Continental	58	1-31	Gas-cond.	11,668-78	14,580	0	0
Continental	59	8-10	Oil	12,732-36	13,259	0	1
Continental	84	6-28	Oil	10,857-62	14,500	0	1
South Pass:							
California	5	5-14	Oil	9,079-90	11,000	0	0
Shell	6	1-16	Oil	8,337-49	11,010	2	0
Shell	30	7-10	Dry gas	9,528-46	13,468	0	0
California	41	4- 2	Oil	10,096-10,108	13,972	0	0
Main Pass:							
Continental	25	3-28	Oil	6,224-30	10,002	[5]4	0
Kerr-McGee	47	7- 5	Oil	8,192-8,218	8,600	[9]1	0
Breton Sound:							
Republic Nat.	1	5-11	Gas-cond.	7,421-23	8,999	[10]3	0

(1) Two dry holes and one gas-condensate well in deeper pay (12,315-30 ft.); (2) dry hole at 13,577 ft.; (3) dual oil producer in two new-pay zones (10,424-36 and 11,582-93 ft.); (4) one dual oil well in sands at 6,322-35 ft. and 6,525-40 ft., and one dual oil and gas-condensate well in sands at 6,215-25 ft. and 6,639-50 ft.; (5) dry hole at 13,648 ft.; (6) oil well in new-pay zone (6,854-66 ft.); (7) not completed—logged eight potentially productive sands from 9,845 ft. to 14,021 ft., and flowed oil in tests of sands at 13,614-20 ft. and 9,868-74 ft.; (8) dry holes; (9) gas-condensate well in new pay (7,710-15 ft.); (10) dry holes.

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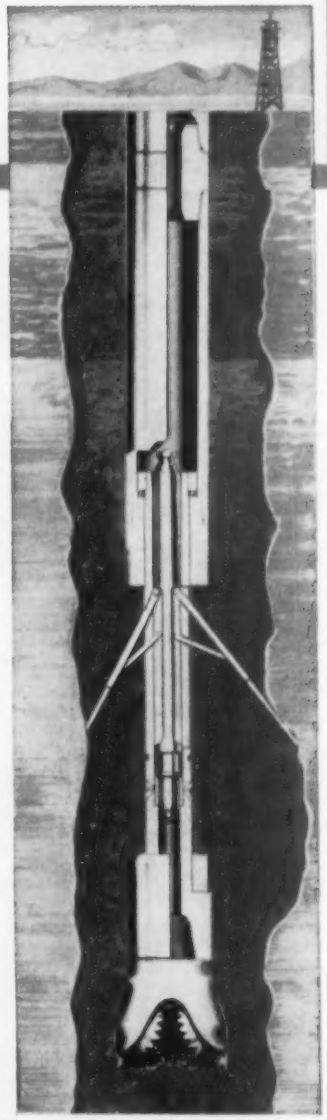

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MID-CONTINENT

OKLAHOMA

McClain County Has New Bromide Sand Discovery

Carter Oil Co. has opened a new Bromide sand oil pool on a fault block next to the Southwest Wayne area of McClain County.

The firm's 1 Goodall, NW SW SW 11-5n-2w, flowed 165 bbl. of oil in 8 hours on 14/64-in. choke, natural, from perforations in the first Bromide sand at 8,068-86 ft. This is a daily rate of 486 bbl.

KANSAS

Cowley County Has Tri-Zone Oil Discovery

George P. Vye 1 Shoup, SE NE SW 18-31s-3e, is a a three-zone oil discovery prospect in western Cowley County.

The well is ¾ mile north of Churchill pool, separated from the producing area by a dry hole. Recovery on a drill-stem test of the Hoover sand at 1,671-85 ft. was 365 ft. of clean oil and 60 ft. heavily oil-cut mud. Recovery in the Kansas City lime at 2,418-30 ft. was 2,250 ft. gas, 105 ft. clean oil, and 60 ft. heavily oil and gas-cut mud. The Arbuckle showed for oil at 2,780 ft. on samples.

Northwest Lincoln Pool Confirmed in Stafford County

Sunray Mid-Continent Oil Co. and D. R. Lauck have completed a confirmation test of the Northwest Lincoln pool which was opened in Stafford County in October. The new well is the 1 Morrison, SW SW SW 21-21s-14w.

The Simpson sand was topped at 3,748 ft. On a 30-minute drill-stem test, gas surfaced and 2,570 ft. of oil was recovered. Bottom hole pressure was 1,160 psi. The Arbuckle formation was topped at 3,784 ft. and showed oil staining to the total depth of 3,800 ft. The operator is running 5½-in. casing.

The well is a confirmation of the 1 Fullerton, a Simpson sand discovery which swabbed 45 bbl. of oil an hour. The new test is highly structurally and gives indications of proving as favorable as the discovery well where fluid level is now at the top of the hole as a result of good porosity and permeability of the pay sand.

ARK-LA-TEX

NORTH LOUISIANA

Pettet Oil Recovered At West Lisbon Well

Oil from the Pettet was recovered at J. D. Caruthers and Associates 1 King in West Lisbon field, Claiborne Parish.

The operator reported 360 ft. of oil cut with mud and gas and 210 ft. of heavily oil and gas-cut mud on a test at 5,511-51 ft. This well is 1½ miles southwest of the discovery well in the

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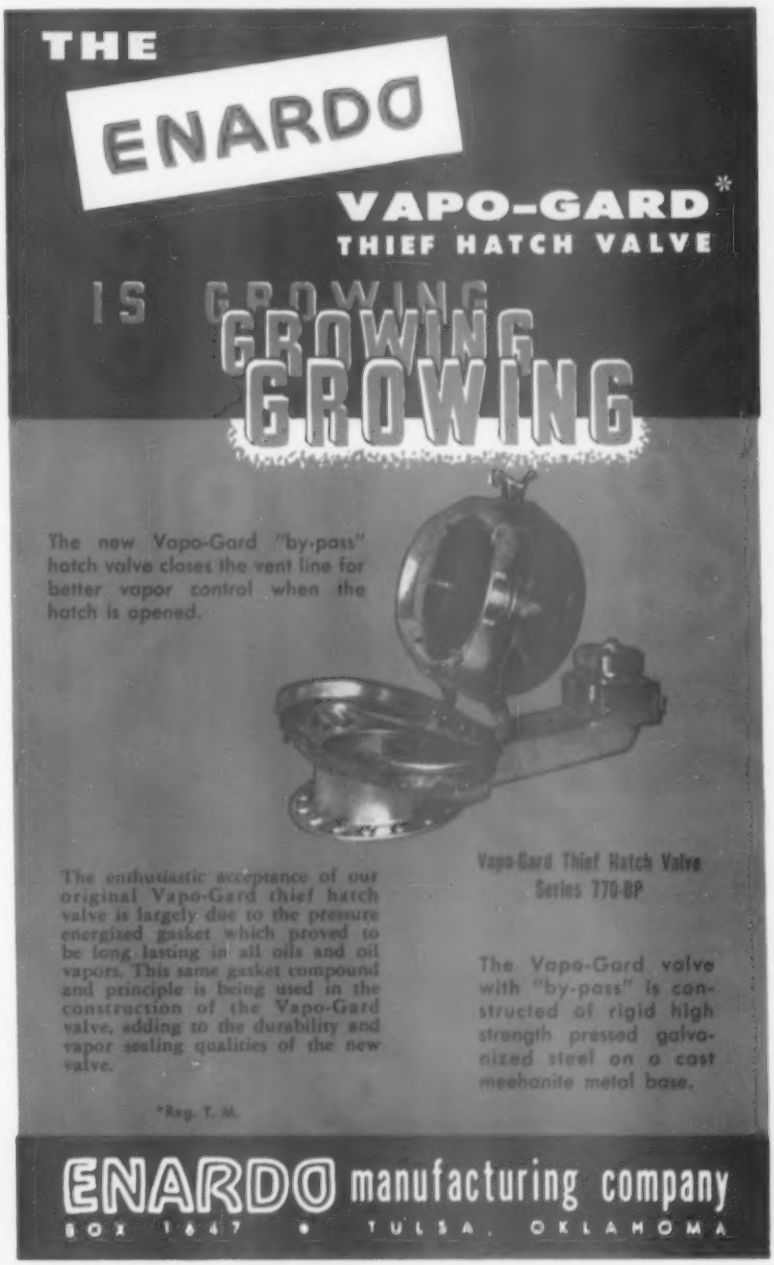
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field. The discovery well at West Lisbon produces from Haynesville.

EAST TEXAS

Smackover Test Planned; Extension Well Completed

Week's developments in East Texas included plans to start a new 10,000-ft. Smackover wildcat 2½ miles northwest of production in the Jefferson sector of Rodessa field, and final test on a new Woodbine strike, or extension well, in the new South Slocum area.

The new prospector is Thomas Jordan, Inc., New Orleans, 1 C. C. Braden. Location is in Henry Warnell Survey, A-421, 9 miles north of Jefferson, in northern Marion County. The announcement called for starting work soon.

Apache Drilling Co. and A. J. Crevolin 1 Mixer, W. T. Sadler Survey, 2 miles south of the town of Slocum, has been completed as a Woodbine well. Flowing potential was 102 bbl. a day through 16/64-in. choke. Gas-oil ratio was 1,050:1. Pay was perforated at 5,934-40 and 5,941-45 ft.

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OKLAHOMA PANHANDLE

Beaver County Wildcat Nearing Completion

Sunray Mid-Continent Oil Co. 1 Palmer is shut in for tank space. The indicated Morrow sand discovery well is located in NE NE SW 28-1n-21eCM, one township east of Warren Petroleum Corp.'s 1 Bowles, another Morrow discovery well.

The 1 Palmer swabbed and flowed 320 bbl. of load oil in 24 hours on 18/64-in. choke from perforations at 8,042-62 ft. The 1 Bowles, SE SE NW 22-1n-20eCM, was completed flowing 15 bbl. of oil per hour through 2-in. tubing from perforations at 7,253-66 and 7,272-78 ft. in the Morrow. Warren has another well drilling at 1 Harris, C SE NE 19-1n-21eCM, 2 miles northwest of the 1 Palmer.

Panhandle Eastern Pipe Line Co. 2-18 Enns is a Morrow gas discovery inside Hugoton gas field.

Geological Wildcat Finaled As Inside Hugoton Gas Well

Another Pennsylvanian area has been opened inside big Hugoton-Permian gas field in the Oklahoma Panhandle. The discovery well, a geological wildcat, is Panhandle Eastern Pipeline Co. 2-18 Enns, C SE NW 18-3n-18eCM.

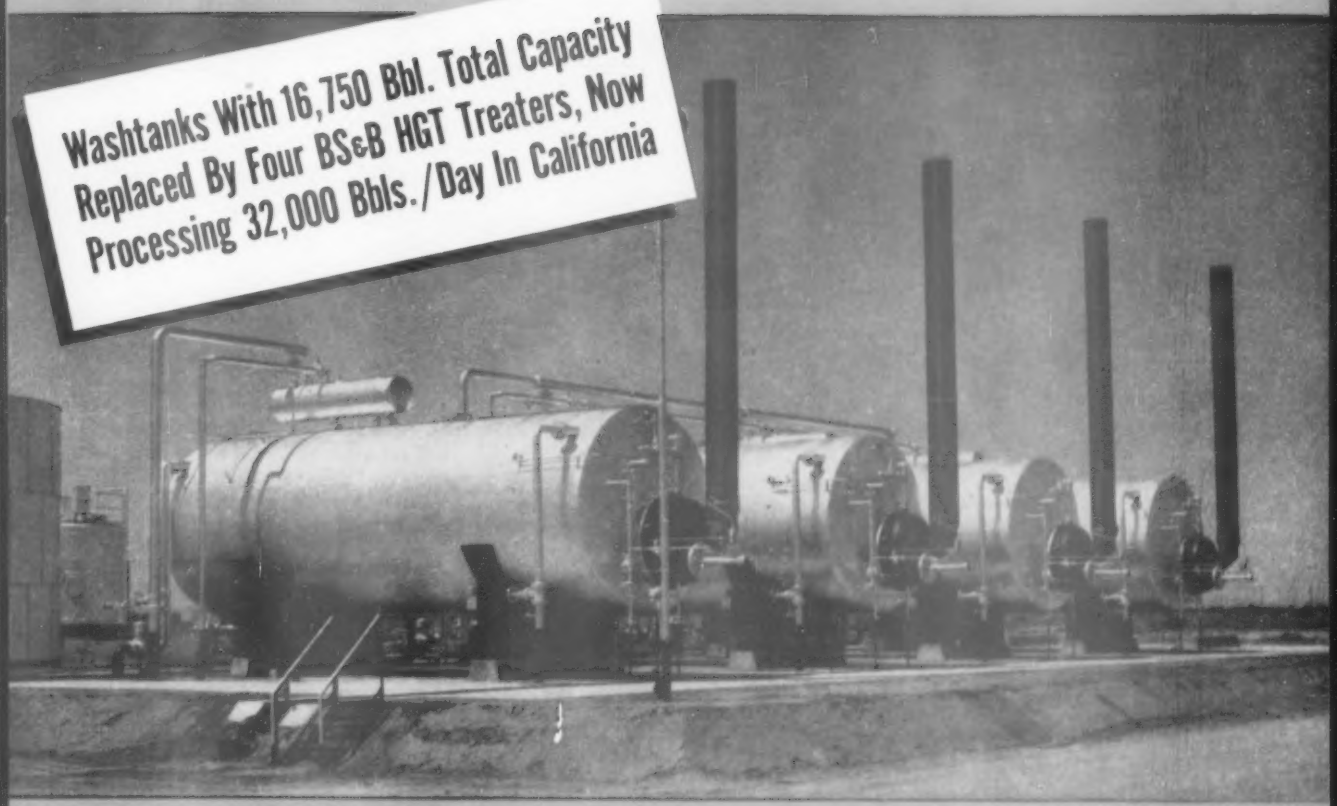
The well made an open flow of 67,500 M.c.f. of gas per day. Deliverability test made 22,000 M.c.f. per day. Perforations were at 6,230-72 ft.

Greenough Field Extended To the East in Beaver

An upper Morrow gas discovery has extended Beaver County's Greenough area to the east. The well is Carter Oil Co. 1 Still, C NE SW 4-5n-22eCM.

The well flowed 7,120 M.c.f. of gas per day on a drill-stem test at 6,293-6,314 ft. Drilling continues at the well.

New BS&B Horizontal Emulsion Treaters Effect Substantial Fuel Cost Savings!



These four new BS&B Horizontal Emulsion Treaters are presently removing 4000 bbls. of water per day from a total wellstream production of 32,000 bbls. of 35 API emulsified oil per day. They are operating with a 10° F. reduction in treating temperature, a 30% saving in chemical costs, and a substantial reduction in fuel gas used. These treaters are in service in the Bakersfield, California, area for one of the major oil companies, and replace one 3000 bbl., seven 1500 bbl., one 1000 bbl. and three 750 bbl. washtanks.

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TEXAS PANHANDLE

Two Oil Strikes Finaled in Ochiltree

Union Oil Co. of California today announced two oil discoveries in Ochiltree County, in an area heretofore primarily productive of gas.

The two discovery wells in the Farnsworth area have been completed in the Morrow sand at a depth of approximately 8,000 ft.

The 1 Buckhaults established an initial flowing rate of 320 bbl. a day of 38°-gravity crude oil. The 1 Russell, the second discovery, 1½ miles north, swabbed and flowed at the rate of about 300 bbl. a day and is being placed on the pump.

APPALACHIAN

WEST VIRGINIA

In Dry Fork district, Randolph County, West Virginia, Columbian Carbon Co. 1-1208 D. Hill Arnold, wildcat, first completed drilling several months ago with a good flow of gas in the Oriskany sand, is conducting deepening operations and a large volume of gas has been encountered in this formation. The flow at 4,962 ft. started at 2,338,000 cu. ft., and at various depths has increased to 9,832,000 cu. ft., with a rock pressure of 2,030 psi. in 44 hours. Drilling is at 5,008 ft. Further development in this area will probably be started soon.

OHIO

The north part of Layland pool in Killbuck Township, Holmes County, was extended by two completions of the Disbennett Petroleum Co. Their 1 (2) Catherine Foreman, Section 24, topped the Clinton sand at 3,299 ft. and was drilled in to 3,356 ft. with an open flow of 1,150,000 cu. ft. natural. Their 3 Harold Hoxworth, Section 25, gaged 70 bbl. daily after fracturing sand found at 3,447-3,452 ft.

- The Hipp Lumber Co. moved ¼ mile south to the town of Greer and brought in an 80-bbl. well on 1 Ralph Hipp, Section 1. Clinton was reported at 2,788-2,840 ft. with a good showing natural and fractured.

- Preston Oil Co. 2 Varner, along the east side of Cottage Hill pool in Hopewell Township, Muskingum County, logged the Clinton at 3,195-3,248 ft. and gaged 135 bbl. in a 24-hour test.

EASTERN KENTUCKY

In Leslie County United Fuel Gas Co. continues testing at their wildcat 20 Fordson Coal Co. After shooting the Corniferous section from 2,492 to 2,607 ft., the well tested after a 48 hour period—133,000 cu. ft. of gas daily and 34 bbl. of oil. Producing horizon had oil and gas showings at several intervals from 2,502-95 ft. Top of formation was logged at 2,500 ft., base at 2,607 ft. Hole is bottomed at 2,614 ft. in Clinton (Silurian) shale.

WESTERN CANADA

ALBERTA

Light Oil Show Reported At Smoky Heights Wildcat

Amerada Petroleum Corp. reported an interesting light-gravity oil show at its Smoky Heights wildcat. This test gave up oil recoveries on drill-stem tests in a basal Devonian sand and on production test gave up both oil and salt water.

The well, Amerada 9-10 "AM" Crown, LSD 9, 10-74-1w6, is 30 miles northeast of Grande Prairie, 22 miles northwest of Sturgeon Lake oil field

THE OIL AND GAS JOURNAL

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and 85 miles south of Clear Hills oil field.

Recoveries of up to 1,000 ft. of clean oil and some salt water were encountered during tests in the basal Devonian. Crew drilled the well to 9,883 ft., total depth, and ran a string of casing to total depth.

Gas Found in Second Zone at Control Wildcat

Mobil Oil of Canada, Ltd., announced discovery of gas in a second zone at its Control area wildcat in southeastern Alberta.

Earlier last week the well, Mobil-CPR 7-16 Control, LSD 16, 7-24-16w4, was reported as a Viking sand gas discovery. The second indicated commercial gas flow rate was reported during a drill-stem test in the basal Blairmore.

This wildcat is 11 miles west of Control and 75 miles east of Calgary.

SASKATCHEWAN

Gas Discovery Reported At Plenty Area Wildcat

Royalite Oil Co., Ltd., announced the discovery of gas at its current wildcat in the Plenty area of southeastern Saskatchewan. This well, in an area where extensive exploration work has been carried out by the company, is the first test to indicate natural gas in commercial quantities.

The well, Royalite 12-20 Plenty, LSD 12, 20-32-19w3, is 7 miles northeast of Cook Lake gas area. During drill-stem test in the Viking at 2,006-31 ft. the well flowed at the maximum rate of 900 M.c.f. per day.

Light Oil Hit Reported In the Wauchope Area

The McCarty & Coleman group has indicated discovery of light-gravity oil at its Wauchope area wildcat in southeastern Saskatchewan.

This test, 6-26 Knight, LSD 6, 26-7-34w1, is 55 miles northeast of Estevan and 25 miles northwest of Alida field. During a drill-stem test in the Mission Canyon-Mississppian the well recovered 600 ft. of clean oil from 3,795-3,805 ft.

EASTERN INTERIOR

ILLINOIS

In Clinton County Hamil Oil Co. 1-B W. M. Wortman, S½ NW SE 27-3n-1w, 4 miles northwest of Sandoval, flowed 10 bbl. of oil per hour, natural, on ⅛-in. choke. Production is from the Devonian at 2,850-55 ft. The well is 2 miles from production.

● In Christian County, Lowell G. Ewart 1 Niana C. Davis, NW SE SW 26-14n-3w, 5 miles northwest of Taylorville, will test in the Devonian sand at 1,796-98 ft. Recovery on a test at 1,794-1,809 ft. was 450 ft. of clean oil, 30 ft. muddy oil. This well is also 2 miles from production.

● In Coles County, 10 miles north of Mattoon in SW NE SW 19-14n-8e, Hill Production Co. 1 Hill has been completed flowing 250 bbl. of oil daily from the Rosiclare lime, natural. Perforations are at 1,801-06 and 1,806-22 ft. The well is ½ mile from production.

GREAT LAKES

MICHIGAN

Prospects of a new Berea oil pool in Marathon Township, Lapeer County, appeared promising as pay was tested at John W. Johnson 1 Clemons, SE NW SE 16-9n-9e.

Top of Berea sand was logged at 1,449 ft. Gas started to show between 1,499 and 1,451 ft., but long string of 5-in. casing was cemented in at 1,451 ft. An increase in gas, estimated at 300,000 cu. ft., showed at 1,454-61 ft. First oil showed at 1,465 ft. with pay

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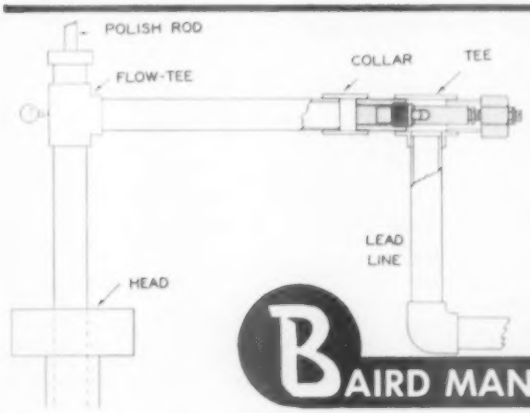

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called at 1,465-67 ft. An increase in gas was also reported with the oil pay. A gage of the increased gas, plus a blow-down of first gas logged, was reported 125,000 cu. ft. Of this total, 40,000 or 50,000 cu. ft. of gas showed with the oil pay. Hole carried between 125 and 144 ft. of free oil natural on a fill-up test, considerably more oil than was logged in the 1 Glady, first Berea sand test in the area recently which was near-commercial in this horizon. The 1 Glady, located 3 10-acre locations east and 1 south of the Clemons, was about 13 ft. lower on oil pay and 17 ft. lower on Berea than new well. No gas showed in Berea at the 1 Glady. Operator plans to fracture Berea pay at new well as soon as trucks can be moved to mud-bound lease.

PACIFIC COAST

CALIFORNIA

Northern California Gas Field Activity

One successful wildcat completion and testing reports of another wildcat highlighted activity in Northern California's gas fields last week.

Honolulu Oil Corp. completed and shut in its 1 Honolulu-Humble-Carter wildcat 1 mile southeast of its recently discovered South Princeton field in Colusa County. This latest outpost test, SW SW 7-17n-1w, was completed in the perforated intervals 2,030-30 ft., 2,040-42 ft., and 2,248-53 ft. Before completion the well blew dry gas at a rate of 2,820 M.c.f. daily on a test. No estimates were available on the completed production rates. The South Princeton field discovery, 1 Honolulu-Humble-Tuttle, was completed last July for 2,030 M.c.f. from the perforated interval 2,380-95 ft. South Princeton field is 4 miles south of Princeton field.

Gene Reid Drilling Co. was testing 1 Capital Co., a wildcat 4 miles southwest of the Beehive Bend gas field in the Willows area of Glenn County. The wildcat flowed gas at a 1,000 M.c.f. rate on a test of the intervals 5,938-43 ft. and 5,948-56 ft. The operator had set a bridge plug in the 5,993 ft. well and was preparing to test higher.

Eocene Production Search in Guijarral and Coalinga Areas

Santa Fe Drilling Co. abandoned its 11,734 ft. 27X-24 Guijarral Service wildcat in the Northwest Guijarral Hills area of Fresno County. This test, SW SW 24-20s-16e, about 2 miles north of the Polvadero area of the field, was aimed at Eocene production. The recently discovered Bourdieu pool in the Polvadero area is producing between 10,500 and 10,965 ft. in the Gatchell sand which is of Eocene age. Santa Fe swabbed salt water on a test of the upper intervals after failing to complete the well at lower depths.

Another test aimed for Gatchell sand production was Reserve Oil & Gas Co.'s 44-33 Reserve Union. This projected deep test in the Caliota area was drilling ahead at 5,022 ft. on a site SE NW 33-19s-16e. That is about 1½ miles east of Coalinga field extension production and about 4 miles northwest of Santa Fe's abandoned 27X-24 Guijarral Service.

Richfield Trying to Recomplete Deep Producer

Richfield Oil Corp. was trying to put back on production its 27-69 Coles Levee A, which was completed as the world's deepest producer 2 years ago. This well, located in the North Coles Levee field of Kern County, was originally brought in for 119 bbl. of crude daily from the interval 17,497-17,892 ft. However, production dropped off rapidly and the well has been idle for many months. Richfield was trying to recomplete the well in the Stevens sand, which produces at a depth of about 9,500 ft.

ROCKY MOUNTAIN

NORTHWEST NEW MEXICO

Pennsylvanian Shows at Area's Deepest Wildcat

Magnolia Petroleum Co. 1 Jicarilla "A" in NE SW SE 18-23n-2w, Rio Arriba County, Northwest New Mexico's deepest hole, is showing as a possible Pennsylvanian discovery.

The operator is running pipe after testing gas at the rate of 72 M.c.f. per day on a drill-stem test at 12,714-12,833 ft. The well would also be the deepest producer in the region if completed at this interval. Total depth of the wildcat is 13,590 ft. It is northwest of Lindrith-Dakota oil field. There have been no previous granite tests in this area.

MONTANA

Testing Under Way at Hill County Prospect

Production tests have started at The Texas Co. 1 De Martin in C NE SW 34-34n-9e, Rudyard area, Hill County.

The wildcat pumped 32½ bbl. of fluid of which 20 bbl. was load oil and 12½ bbl. of new oil on a 6½-hour pump test. Production is from the Sawtooth at 3,374-84 ft. and 3,400-11 ft. The second test in the area, the 1 Anderson, C SE SW 27-34n-9e, ¾ mile north of the De Martin well, has been spudded.

WYOMING

Oil Recovered at Natrona Sage Spring Creek Well

Amerada Petroleum Corp. reports recovery of 4,260 ft. clean oil on a test at 6,572-91 ft. in the Dakota at 37 Unit, C SE NW 12-37n-78w, Sane Spring Creek Unit, Natrona County.

This confirmation well to the 36 Unit, a 265-bbl.-per day well, is on the western flank of the Powder River basin.

Big Gas Flow Reported At Hogsback Unit Well

A gas flow estimated at 19½ million cubic feet daily has been reported at General Petroleum Corp.'s Hogsback Unit in Sublette County, western Wyoming.

Operator reported the well produced from perforations at 6,488-7,099 ft. in both the first and second Frontier. The gage reportedly is one of the largest tested in Green River basin exploration. The well is 3 miles west of LaBarge field. The unit lies in both Lincoln and Sublette counties.

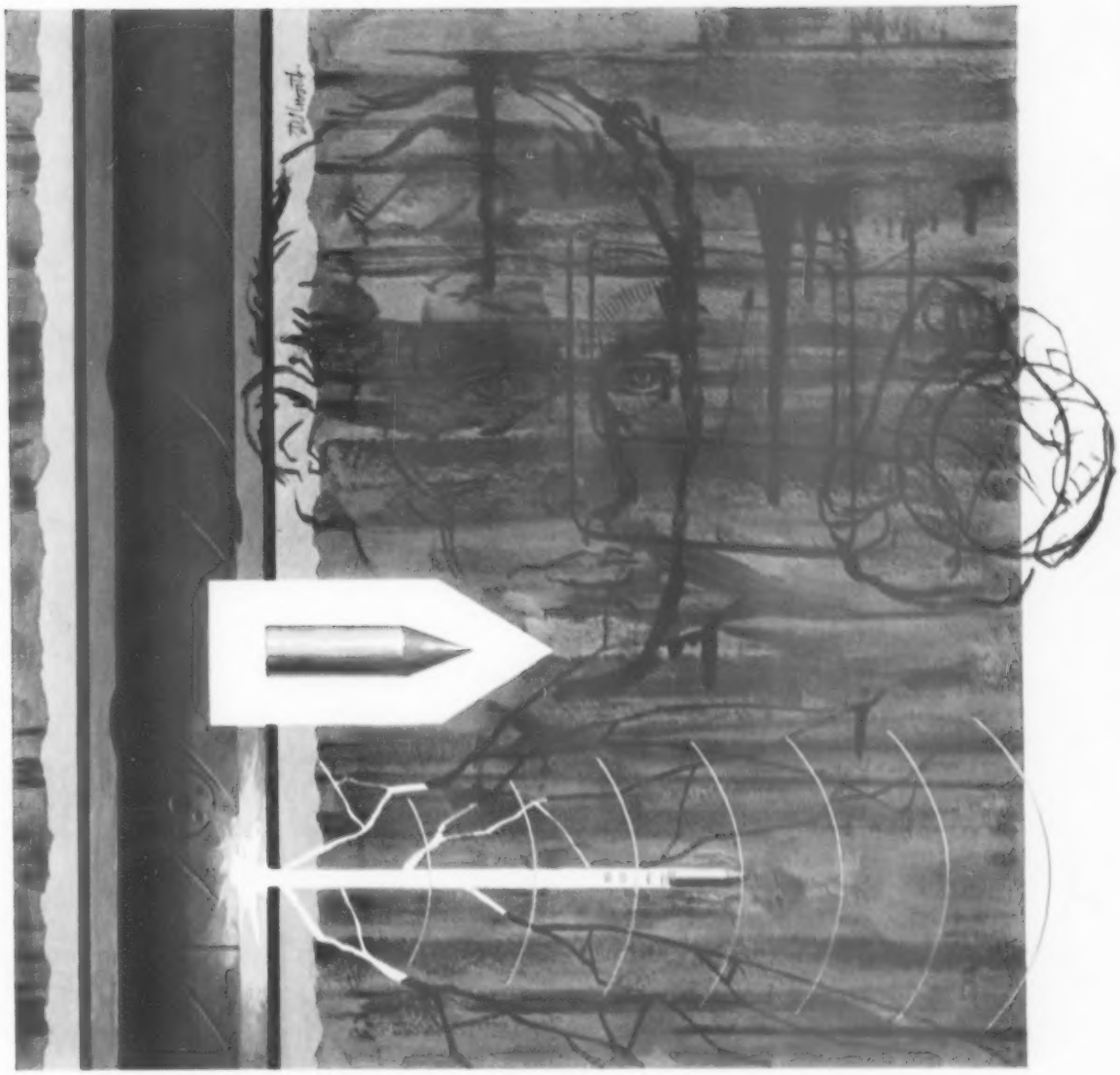
WEST TEXAS-NEW MEXICO

WEST TEXAS

Gaines Strike Finaled, Dawson County Recovers Oil

Scott Hammons and others' 1-M University, Devonian discovery in the southeastern corner of Gaines County, has been completed as a good flowing well. Initial production of 360 bbl. of

Drilling & Exploration Co. and others 1 H. E. Wells, in western Dawson County, had two successful drill-stem tests in the Devonian at this writing.



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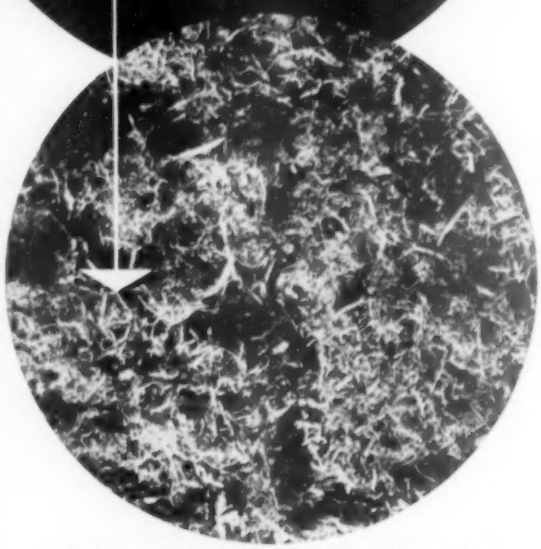

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41° oil was through 8/64-in. choke, from perforations at 12,356-76 ft. Flowing tubing pressure was 815 psi.

The well was drilled to the Ellenburger, topped at 13,285 ft. Other tops logged were: Spraberry 8,330 ft., Wolfcamp 9,770 ft., Pennsylvanian 10,900 ft., Mississippian 11,390 ft., Devonian 12,358 ft., Silurian 12,630 ft., Fusselman 12,740 ft., and the Simpson at 13,210 ft. Elevation is 2,967 ft.

In Dawson County the second drill-stem test of the Devonian had assured production at an old well drilled deeper.

Drilling and Exploration Co. and others' 1 H. E. Wells reported sample-top of the Devonian at 12,030 ft., with derrick floor elevation of 3,043 ft. Initial drill-stem test at 12,030-80 ft., open 2½ hours, developed oil and gas-cut water blanket, plus 690 ft. of free oil.

On test at 12,080-100 ft., recovery included 9,060 ft. of oil and 90 ft. of oil-cut mud, with no formation water. Flowing pressure ranged from 1,160-4,080 psi., and 30-minute shut-in pressure of 5,120 psi.

This test was drilled earlier in the year and completed dry at 9,763 ft. At that depth it was in a reef formation.

GULF COAST

SOUTH LOUISIANA

Another Important Field Looms in Acadia Parish

J. P. Owens and associates of Shreveport and Houston, with Arkansas Fuel Oil Co. and Gulf Refining Co. as joint operators, last week opened what is indicated to be another important oil field in southwestern Louisiana's Acadia Parish.

It is Acadia Parish's third good oil-field discovery within 6 months. It follows within 6 week's Humble Oil & Refining Co.'s oil-field discovery in the Wickoff Bayou area, less than 4 miles northeast. It is only 7 miles south of the spreading Grand Coulee field, opened last May by Vincent & Welch, Inc., of Lake Charles.

Another important oil field for Acadia Parish seems assured at J. P. Owens and associates 1 Robinson et al.

The new discovery well, 1 Robinson et al, 2 miles northwest of here, flowed at the rate of 410 bbl. of 39.6°-gravity oil per day through 3/32-in. choke. Flow was under pressure of 7,050 psi. Bottom-hole flowing pressure of 11,400 psi. had been recorded. Gas-oil ratio was 875 cu. ft. per barrel.

Production is from a lower Frio sand, perforated at 12,785-90 ft. Humble's Wickoff Bayou discovery well, 2 miles northeast of here, is productive from perforations at 12,203-19 ft. Its completion flow was 180 bbl. of 42.7°-gravity oil per day through ⅛-in. choke. A confirmation well is drilling.

Four wells, including the discovery producer, have been completed at Grand Coulee. The first three were completed as oilers from a 10,200-ft. Frio sand. The fourth, completed last week, is a gas-condensate producer from a 10,400-ft. sand, and extends the field 1 mile north. Another indicated well, located 1 mile southwest of production, is testing the field's oil zone.

Successful Wildcats

NORTH TEXAS

Clay County: L. T. Burns estate 1 South, Blk. 14, Hopkins CSL, A-176, 1½ miles SE Gluegrove. IP 125 BOPD, 12/64-in., TP 1,050 psi., GOR 650, 44°, Mississippian 5,910-50 ft. TD 6,101 ft.

Wilbarger County: Anderson Oil Co. and associates 1-B Waggoner estate, 55-4-H&TC, 4½ SW Harrold. IPP 22 BOPD, 37°, GOR 300, pay 1,237 ft. TD 2,005 ft.

Wise County: Lone Star Producing Co. 1 Lawson, Blk. 7, Van Zandt CSL, A-1182, 3 miles E Paradise. IP 4,730 M.c.f. gas, pay 5,493-5,762 ft., shut-in pressure 740 psi. TD 6,307 ft.

WEST CENTRAL TEXAS

Jones County: F. Kirk Johnson 1 Phillips, 16-19-T&P, 7 miles NW Merkel. IPP 166.5 BOPD, 46°, GOR 132, Canyon sand 5,346 ft. TD 5,382 ft.

Stephens County: Fletcher Oil & Gas Drilling Corp. 1 Swenson, 6-6-T&P, A-2558, 4 miles E Wayland. IPP 82 BOPD, 41°, GOR 560, Strawn sand 2,678-90 ft. TD 3,050 ft. Leo Vesenmeier Jr. 3 Liles, MEP&P Sur., A-116, new pay in Eloise Kay (Mississippian) field. IP 264 BOPD, 16/64-in., TP 420 psi., GOR 325, 41.5°, Marble Falls conglomerate 4,222-34 ft. TD 4,543 ft.

Taylor County: Andrew J. Crevolin 1 Key, A. Winter Sur. 432, 4 miles SW Lawn. IPP 126.84 BOPD, 39°, Morris sand 3,750-54 ft. TD 4,225 ft.

SOUTHWEST TEXAS

Duval County: The Texas Co. 2-B DCRC NCT-32, Norman G. Collins Sur. 203, A-918. IPP 5.16 BOPD, 20.8°, perforations 2,136-47 ft. TD 2,410 ft. (New pay in Petrox field.)

TEXAS GULF COAST

Calhoun County: Glasscock-Tidelands-Arkansas Fuel Oil Co. 1 State Tract 102, Hynes Bay. IP 156 BOPD, ¼-in., 43.5°, perforations 7,711-26 ft. (New pay in, and extends Hynes Bay field—second well and first oil production.)

Arnold H. Bruner & Co. et al 1 Fitzgerald, Lot 50, Olivia townsite. IP 170.7 BOPD, 9/64-in., 40.1°, perforations 7,526-32 ft., and (dual completion) 59.1 BOPD, ¼-in., 39°, perforations 7,512-20 ft. TD 8,372 ft. (New pay in Olivia field).

Fort Bend County: Russell Maguire 3 Moore, BBB&C Sur., A-135. IP 3,720 M.c.f. daily, open-flow potential, GLR 101,456 cu. ft. per bbl., 46.7°, perforations 8,121-27 ft. and (dual completion) 11,300 M.c.f. daily, open-flow potential, GLR 59,839 cu. ft. per bbl., 63.6°, perforations 8,190-8,200 ft. TD 8,603 ft. (New pays in Barb-Mag field.)

Jackson County: John B. Coffee 1-K Kountze & Stewart, T. M. Dorsett Sur. IP 138 BOPD, 7/64-in., 43°, perforated 6,725-28 ft. TD 6,767 ft. (New field—old well drilled deeper.)

San Patricio County: George K. Taggart and Slick Oil Co., Ltd., 1 Cunningham, Section 57, George H. Paul Subd. (1½ miles southwest of Taft). IP 85.25 BOPD, 9/64-in., 34°, perforations 6,295-98 ft. TD 6,350 ft. (New field—northeast of Midway West area.)

George H. Coates 1 Scheble, Se. 27, George H. Paul Subd. IP 5,000 M.c.f. daily, open-flow potential, perforations 8,297-8,305 ft. TD 8,830 ft. (New field.)

WEST TEXAS

Andrews County: Chambers & Kennedy, Zapata Petroleum Corp. 1 Lockhart & Brown, 19-A41-PSL, 13 miles SW Andrews. IP 127 BOPD, 10/64-in., TP 125 psi., GOR 435, 37.5°, San Andres 4,315-4,457 ft. TD 4,457 ft., ground elev. 3,286 ft.

Garza County: Robert L. Wood, Curtis R. Inman 1 Sims, 645-1-GC&SF, 11 miles N Post. IPP 65 BOPD, 35°, GOR reported under 200, Glorieta 3,681-95 ft. TD 4,310 ft.

Howard County: Humble Oil & Refining Co., Goldston Oil Corp. 1 Anderson, 15-31-T2N-T&P, 20 miles NE Big Spring. IP 187 BOPD, ¼-in., TP 500 psi., GOR 1610, 46.4°, Canyon reef 7,708-14 ft. TD 7,714 ft., elev. 2,632 ft. Completed natural.

Phillips Petroleum Co. 1 Satterwhite, 12-32-T1N-T&P, 5 miles NE Big Spring. IP 581 BOPD, ½-in., TP 270 psi., GOR 924, 49.4°, Fusselman 9,592-9,606 ft. TD 9,905 ft., elev. 2,650 ft.

SOUTHEAST NEW MEXICO

Lea County: Cabot Carbon Co. 1-A State, 33-15s-35e, NE. of Townsend-Wolfcamp field. IP 267 BOPD, 22/64-in., TP 325, GOR 1360, 39.5°, Wolfcamp top 9,670 ft., perforated 10,549-84 ft. TD 10,604 ft., elev. 4,002 ft.

SOUTH LOUISIANA

Acadia Parish: J. P. Owen et al 1 Robinson et al, 19-9s-1e. IP 401 BOPD, 3/32-in., 39.6°, perforations 12,785-90 ft. TD 13,521 ft. (New field.)

Lafayette Parish: Sunray Mid-Continent Petroleum Co. et al 1 Traham, 20-10s-3e. IP 533 BCPD and 2,600 M.c.f. daily, 5/32-in., 49.7°, perforations 12,158-74½ ft. (basal Frio). TD 12,225 ft. (New field.)

Terrebonne Parish: Humble Oil & Refining Co. 2-A State Lease 1035 (OCS 019),

(Continued on page 177)

Canadian Veteran

Taylor is new Imperial production chief in West

VERNON TAYLOR, who has spent a quarter century as geologist and petroleum engineer in Canada's major oil fields, is Imperial Oil, Ltd.'s new manager of production for Western Canada.

In his new post Taylor will direct Imperial's exploration and production operations in the four western provinces and the North West Territories. He comes to the top production job after more than 25 years spent in Canadian oil operations including tours of duty in Turner Valley and Leduc.

Taylor is a native of Winnipeg. He attended school there and took his B.A. and B.S. in geology degrees from the University of Manitoba. He first came to Alberta in 1929 as a subsurface geologist with the Dominion Government. In 1930 when natural resources were transferred to the provincial government, Taylor joined the Alberta government staff, centering most of his activities in the Turner Valley field.

In on discovery . . . Taylor joined Imperial as a petroleum engineer at Turner Valley in 1937. He was appointed operations manager of western producing in Calgary in 1945 and in that capacity was on hand when Imperial Leduc No. 1 was discovered early in 1947.

Now fairly well tied to a desk and executive attire, Taylor was a familiar figure in fur-trimmed parka and ski-cap around the Leduc field during its early development. From 1948 to 1951, Taylor was operations manager for Imperial's producing department in Toronto and in 1951 returned to Calgary as management assistant in western producing. He held that post when named to his new job as manager of western production.

Piano player . . . Despite the size of his job, the energetic Taylor finds time outside of working hours to be a summertime golfer and a wintertime curler. And when the opportunity presents itself, he also can bang a lively piano.

Taylor is the father of three daughters and is particularly proud of the fact the eldest girl is back at his alma mater, University of Manitoba, where she is studying interior design. Two younger daughters attend school in Calgary.

Taylor is an active member of the Canadian Petroleum Association, Calgary Petroleum Club, Calgary Golf and Country Club, Petroleum Curling Club, and Glencoe Club.

Ed Parkes, Shreveport, has been elected vice president and general manager and a director of United Gas Corp. He succeeds M. A. Abernathy, who died November 2 *(The Oil and Gas Journal, November 14)*. Parkes, 51, has been with United Gas for over 27 years, and is vice president and a director of United Gas Pipe Line Co., a United subsidiary.

J. S. (Jim) Fleming, Austin, has been elected president of Del Mar Drilling Co., Corpus Christi. Fleming comes to Del Mar from Heep Oil Corp., Austin, where he headed drilling and production in Texas, Louisiana, and the Rocky Mountains. Del Mar was formed in 1952. The company has three rigs.

Frank D. Lortscher, Long Beach, has been chosen a director of Signal Oil & Gas Co. Now manager of purchases and stores, Lortscher has been a Signal employe for 28 years. He has served as national chairman of the oil buyers group of the National Association of Purchasing Agents.

Bruce A. McCandles has been named assistant managing director of the American Gas Association. He formerly was assistant to the managing director. McCandless joined the A.G.A. staff in 1952 after a stint as assistant to the director of the association laboratories in Cleveland.

B. Brent Breedin, Columbia, S. C., has been named resident manager in Karachi, Pakistan, by Hunt International Petroleum Co., Dallas *(The Oil and Gas Journal, October 24, page 75)*. Breedin is now enroute to Karachi to prepare for drilling and exploration crews, due to arrive there in February and March.

Charles R. Brown, a vice president of Tide Water Associated Oil Co., has been named assistant general manager of the firm's central division, headquartered in Tulsa. Brown currently holds a similar post with Tide Water's western division, San Francisco. A Tide Water employe since 1917, he was elected vice president in 1948.

J. E. Finley has been promoted by Continental Oil Co. to the newly-created post of exploration manager for the firm's West Texas division at Midland, Tex. Finley is former division geophysicist there. He now will coordinate activities of the geophysical, geological, and land departments of the division. Finley joined Continental in 1948 and became geophysical supervisor at Oklahoma City in 1951. He was named division geophysicist at Roswell, N. M. in 1952, and moved to Midland in 1954.

Kenneth Hines, former research physicist for Shell Oil Co. at Houston, has joined Consolidated Engineering Corp., Pasadena, Calif., as a project chief in the systems division. He will specialize in petrochemical instrumentation. Hines co-authored a paper on high molecular weight mass spectrometry presented at the World Petroleum Congress in Rome last June.

R. D. WHITE

R. D. White has resigned as assistant chief geologist for The California Co. in New Orleans, to become chief geologist for Plymouth Oil Co., Sinton, Tex. White replaces **W. H. Conkling,** who resigned recently to open offices in Abilene, Tex., as a consultant. White, since 1940, has been a geologist for Standard Oil Co. of Texas and The California Co.

PERSONALS

James H. Casey has gone to Caracas as assistant to **S. T. Taylor,** manager of exploration in Venezuela for Socony Mobil Oil Co., Inc. Casey is former district geologist for General Petroleum Corp., at Ventura, Calif.

John Emery Adams, research geologist for Standard Oil Co. of Texas in Midland, has been appointed a life member of the West Texas Geological Society. Adams is only the third geologist to receive the honor.

John Partridge, Casper, Wyo., consultant, has been elected president of the Wyoming Geological Association. Other new officers are **Earl West,** Casper consultant, vice president; **Jim Barlow,** Forest Oil Co., second vice president; **Ann Stanley,** Atlantic Refining Co., secretary; and **Wayne Blackman,** Stanolind Oil & Gas Co., treasurer.

G. L. Long, Houston, has been named executive vice president of Southern Geophysical Co., Fort Worth. Long will remain in his present post as head of the Houston division of Southern.

Allen B. Shaw, former faculty member at the University of Wyoming, has joined Shell Oil Co.'s Denver staff as paleontologist.

Bryl Carey, Jr., has resigned as geologist with The California Co. to join the Casper, Wyo., staff of Tennessee Gas Transmission Co. T.G.T. also has announced a new district office will open December 15 at Salt Lake City. **John H. Simons** will be district geologist, and **N. B. (Lefty) Venus** head land man for the new district.

K. J. Ward and **W. J. Mason** have joined the staff of Carmack Drilling Co.'s consulting petroleum engineering division. Ward comes from Hobbs, N. M., where he was a consulting engineer. Mason is a former professor of petroleum engineering and physics at Colorado School of Mines.

E. E. (Wimpy) Moore, former partner in Trident Drilling Co., has formed his own firm, Moore Drilling Co., Ltd., in Calgary. He will begin operating with three rotary rigs. Moore was with Arrow Drilling Co. before the Trident association.

Horace Shumate, of Gulf Oil Corp's West Texas division, has been elected chairman of the Permian Basin chapter of the American Petroleum Institute for 1956. He succeeds **Tom B. Campbell,** general superintendent of J. P. Gibbins, Inc., Midland. Other new officers are **J. O. Ormond,** B.J. Service, Odessa, first vice chairman; **P. E. Fletcher,** Atlantic Refining Co., Midland, second vice chairman; and **Jack Sallee,** Cardinal Chemical Co., Midland, third vice chairman.

E. L. Langston has been chosen to head Western Prairie Oil, Inc., new Denver firm. Other officers are **B. M. Allen,** vice president, and **Bill Young,** secretary. All are former employes of Empire Drilling Co.

B. B. Coester has been named regional geologist for Atlantic Refining Co. at Casper. His former post, Wyoming district geologist, will be filled by **Robert S. Agatston.**

M. G. Cook, geological staff member for Skiles Oil Corp., has been named to manage the firm's new division office in Greenville, Ky. The office was opened to give closer supervision to more then 40 wells now being drilled by Skiles in Kentucky. **William S. Wood** is chief geologist of the new division.

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PERSONALS

Texas Eastern Officials Chat with Pemex Head

Antonio J. Bermudez, right, managing director of Petroleos Mexicanos, chats with four vice presidents of Texas Eastern Transmission Corp. during a party given by Bermudez at the annual meeting of the American Petroleum Institute. Texas Eastern officials, left to right, are John C. Jacobs, C. L. Brockschmidt, Baxter D. Goodrich, and Mills Cox. Cox negotiated a contract with Pemex to buy 100 to 200 million cubic feet of natural gas daily from the Reynosa absorption plant in northern Mexico (The Oil and Gas Journal, October 3, page 98).

John Masters has been named geologist in charge of Kerr-McGee Oil Industries, Inc.'s new district uranium and oil exploration office in Denver. **Vernon L. Mattson** will manage mining and ore processing, and **Breen Kerr** becomes oil geologist. Masters was a geologist with the U. S. Atomic Energy Commission before joining Kermac in July 1953. Mattson, former director of the research institute at Colorado School of Mines, joined the firm last summer.

L. W. Funkhouser has been named to supervise the southeast Louisiana district of the California Co.'s southern exploration division. **B. L. Shulaw** will assume the same post in the southwest district, succeeding Funkhouser.

W. M. Elmer, senior vice president of Texas Gas Transmission Corp., has been elected a director of the firm. Elmer also is president of Texas Gas Exploration Corp., producing subsidiary of the transmission company.

Julian C. Ashby, general manager of Utex Exploration Co., Inc.'s petroleum division, has been named to head the firm's new petroleum headquarters in Abilene, Tex. Utex operates the Mi Vida uranium mine near Moab, Utah, and has oil production in New Mexico and Coleman County, Texas.

Curtis M. Klaerner, manager of the Buffalo refinery of Socony Mobil Oil Co., Inc., has been named assistant operations manager for manufacturing in the company's New York headquarters. Klaerner's post will be filled by **T. C. Lockhart,** now manager of the light-oil operations division in the New York manufacturing department. Klaerner joined Magnolia Petroleum Co. in 1942 and has managed the Buffalo refinery since 1954. Lockhart joined Socony Mobil in 1936 and has held his current post since 1953.

Ben Peck has resigned as division geologist for Arkansas Fuel Oil Corp. to become a consultant in Lafayette, La.

Paul H. Smith and **H. V. Fleming, Jr.,** have been named vice presidents of Refinery Engineering Co., Tulsa. Smith will be vice president for construction and Fleming becomes vice president in charge of sales — both newly created posts.

Bill G. Davis, former geophysicist with Western Geophysical Co. and Gulf Oil Corp., has joined Signal Oil & Gas Co. at Fort Worth in the same capacity.

E. A. MALICK

E. A. Malick has been named to manage the rocket-fuels division of Phillips Petroleum Co.'s research and development department. He formerly was assistant manager, a post now filled by **L. A. Macuila.** Malik joined Phillips in 1946 as chief aviation technologist in the sales department. He later managed the jet-fuels development section of the research and development department. Later he was a technical consultant for the firm and in 1952 was promoted to the rocket-fuels position.

Nash J. Dowdle, president of St. Ann's Petroleum Corp., has been named to head Texas American Oil Corp., recently organized Midland, Tex., firm. Other officers are **C. L. Milburn,** executive vice president; **J. H. Bartley,** vice president; and **D. C. Baldwin,** secretary-treasurer.

DEATHS

Harold M. Davidson, 59, retired refining coordinator of Standard-Vacuum Oil Co., died November 16 in a Morristown, N. J., hospital. Davidson began as an oil-field worker in Louisiana and Arkansas. He later moved to Esso Standard Oil Co.'s Baton Rouge refinery, where he became assistant general superintendent. He had been Stanvac's refining coordinator for 10 years before his retirement last July.

Leonard McMillan, 34, owner of Standard Bit & Pump Co. and Tri-State Bit Co., Reed City, Mich., was killed November 16 in a traffic accident south of Reed City.

Delbert F. Brown, 63, veteran chief librarian for Esso Research & Engineering Co., died November 16 in a Westfield, N. J., hospital. Brown joined the library in 1922, and in succeeding years was credited with making it one of the nation's leading technical libraries.

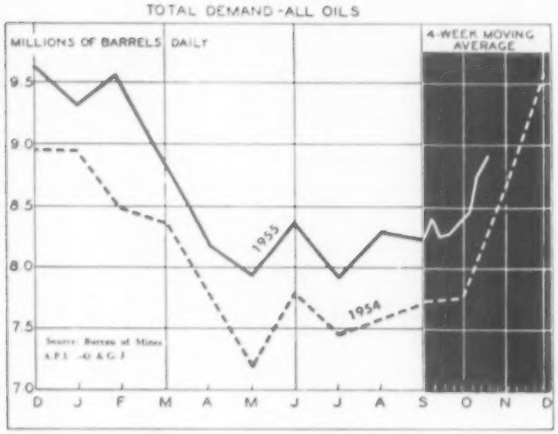
James Brouk, 65, veteran independent operator, died in Tulsa November 21 of a heart attack.

Thomas Brady Foster, 77, pipe superintendent for Sinclair Refining Co. in Houston, died November 18 in a Houston hospital. He had been a Sinclair employe 32 years.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,854,425	UP	54,650	UP	498,430
Crude stocks	257,839,000	UP	1,154,000	DOWN	9,210,000
Completions	1,232	UP	50	UP	190
Refinery runs	7,657,000	UP	104,000	UP	641,000
Gasoline stocks	153,580,000	UP	1,496,000	UP	6,356,000
Distillate stocks	148,661,000	DOWN	1,945,000	UP	13,308,000
Residual stocks	45,293,000	DOWN	468,000	DOWN	10,579,000
Four-product stocks	382,678,000	DOWN	1,535,000	UP	8,074,000
Total imports	1,303,000	UP	170,600	UP	143,800



East Coast Gets Distillate Price Rise That Was Due First of October

TOTAL demand for distillate fuels averaged about 1,360,000 bbl. daily for the 10-week period ended November 10 for a gain of 8.0 per cent over the same weeks last year. Since the period ended with November 11, the gain does not include increased consumption on the East Coast under the influence of the recent cold wave.

About 60 per cent of total sales of distillate for heating is in District 1. The weather has been slightly warmer on the East Coast this fall than it was last year, but may shift to slightly cooler following the current cold weather.

The big increases in number of degree-days so far this season have been in Districts 2 and 4 and in the northern portions of District 5. Except for the upper part of District 2, these areas account for only about 11 per cent of sales of light heating oil.

If reported temperatures for different areas of the country are weighted by normal use of heating distillates in each area, the increase in sales of heating distillate due to weather in the first 10 weeks of the heating season amounts to about 5.0 per cent. Since heating distillates at this time of the year account for only about 50 per cent of total distillate demand, the gain in total distillate sales that can be credited to colder weather is only about 2.5 per cent.

A big part of the increase in heating-oil sales can be credited to the gain in number of oil burners in use. Oil burners expected to be in use at the end of this year represent a gain of about 9 per cent over the number at the end of 1954. Heating-oil sales will be up this winter even if the weather is no colder than last year.

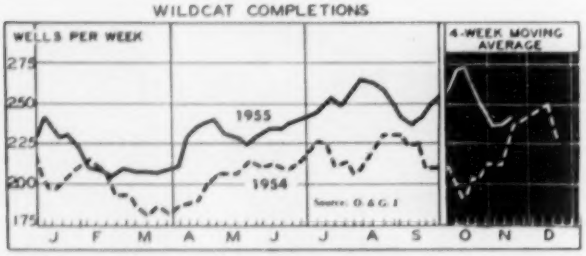
Esso Standard Oil Co. announced the removal of the voluntary summer allowance on heating distillates, effective November 22. This allowance of 0.5 cent a gallon was granted last May to promote summer-fill sales of distillate. After the allowance, barge delivery of No. 2 fuel in New York Harbor was quoted at 9.3 cents a gallon. The price increase of 0.25 cent about the middle of August was added to the posting, bringing quotations up to 9.55 cents. The removal of the allowance brings the price up to 10.05 cents a gallon compared with last winter's quotation of 9.95 cents after the first week of December.

The net increase in prices for light fuel on the East Coast removes some of the pressure on the Gulf Coast. The half-cent gain on the East Coast covers only the increase in shipping cost for spot movement of light fuels. Higher tanker rates had tended to slow up shipments of distillate from the Gulf Coast to the high-demand areas on the East Coast since the total cost of a tanker of No. 2, delivered to New York Harbor, was more than the fuel would sell for on delivery.

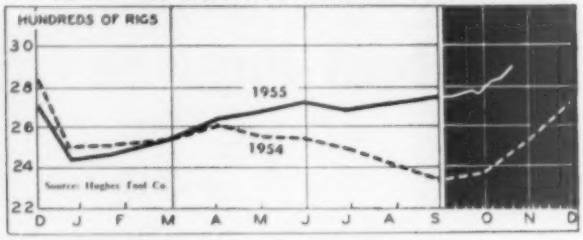
Since a large part of the increase will be taken up by increased transportation costs, it will take another price rise to bring Gulf Coast prices in line with last year.

The low for No. 2 on the Gulf Coast a year ago was 8.5 cents a gallon, the same as the current posting. But, the price moved up twice in December to end the year at 9.0 cents. Will Gulf Coast distillate move up half a cent by the end of December?

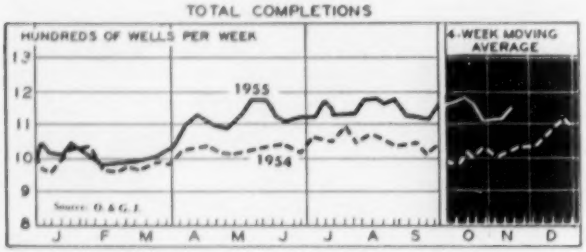
WILDCAT COMPLETIONS



ROTARY RIGS OPERATING IN THE UNITED STATES



TOTAL COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	11-21-55	Change from 11-14-55	Change from 11-22-54
Gulf Coast	613	11	49
N. and W. Texas-New Mexico	993	21	162
Arkansas-N. Louisiana-E. Texas	172	1	—26
Oklahoma	361	—6	37
Kansas-S. Nebraska	194	1	11
Illinois-Eastern	149	15	3
Rocky Mountain	271	6	20
Pacific Coast	145	0	5
Total United States	2,898	49	261
Western Canada	216	17	15

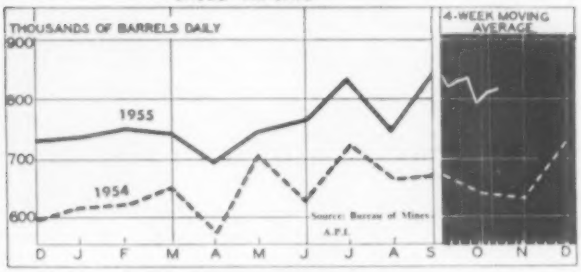
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 19, 1955

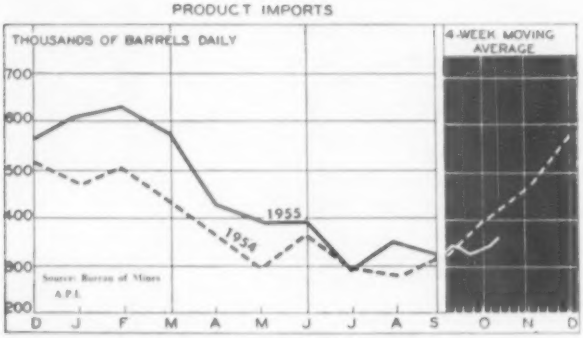
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1955				
	Comp.	Oil	Gas	Dry	Footage	1955	1954	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	5,269	67	94	0	0	0	1	1	1	0	0	64	65
Arkansas	22	13	0	9	61,864	724	546	0	0	0	2	2	32	1	4	149	186
California	48	29	3	16	228,260	2,151	2,095	0	0	0	12	12	39	0	11	396	446
Colorado	29	10	3	16	155,547	1,324	1,172	1	0	0	10	11	44	0	22	644	710
Illinois	75	41	1	33	181,327	3,444	2,584	0	0	1	8	9	61	0	5	486	552
Indiana	19	11	0	8	35,998	643	772	0	0	0	3	3	11	0	0	238	249
Kansas	100	54	5	41	338,008	4,442	4,033	2	0	1	15	18	125	1	32	746	904
Kentucky	45	10	7	28	69,385	1,421	1,028	1	0	0	13	14	52	0	9	300	361
Louisiana	106	69	6	31	649,496	3,581	3,053	3	1	0	14	18	103	73	28	416	620
North	64	47	4	13	209,394	1,854	1,673	1	0	0	4	5	23	11	4	172	210
South	42	22	2	18	440,102	1,727	1,380	2	1	0	10	13	80	62	24	244	410
Michigan	11	7	2	2	34,639	469	503	1	0	0	1	2	12	0	1	178	191
Mississippi	6	1	0	5	39,210	403	371	0	0	0	4	4	14	0	0	148	162
Montana	17	6	0	11	76,632	361	294	0	0	0	9	9	13	0	1	138	152
Nebraska	16	6	0	10	91,502	784	386	0	0	0	5	5	39	0	1	324	364
New Mexico	31	16	9	6	154,133	1,509	969	1	0	0	1	2	38	2	10	100	150
Northwest	10	0	8	2	26,799	519	345	0	0	0	0	0	7	1	10	29	47
Southeast	21	16	1	4	127,334	990	624	1	0	0	1	2	31	1	0	71	103
North Dakota	7	3	0	4	44,918	232	271	0	0	0	3	3	6	0	0	59	65
Ohio	36	15	6	15	70,638	1,085	1,020	0	0	0	0	0	3	0	7	16	26
Oklahoma	191	119	7	*65	621,392	7,568	7,782	0	2	1	12	15	124	18	26	584	752
Pennsylvania-New York	22	8	6	8	35,938	1,333	1,990	0	0	0	0	0	0	0	7	10	17
Texas	416	268	10	138	1,730,972	17,866	16,304	16	1	2	95	114	690	97	116	3,673	4,576
Southwest (1 & 4)	58	30	4	24	214,202	2,755	2,268	2	0	1	15	18	105	30	36	705	876
Gulf Coast (2 & 3)	54	31	1	22	359,982	2,247	2,304	3	1	0	14	18	84	54	36	597	771
East (5 & 6)	26	14	2	10	133,049	868	879	0	0	0	8	8	22	5	9	290	326
North Central (7-B & 9)	163	101	3	59	503,794	6,652	6,245	6	0	1	39	46	327	0	16	1,445	1,788
West (7-C & 8)	92	70	0	22	444,803	4,401	3,754	5	0	0	18	23	147	1	10	604	762
Panhandle (10)	23	22	0	1	75,142	943	854	0	0	0	1	1	5	7	9	32	53
Utah	1	0	0	1	1,945	80	77	0	0	0	1	1	6	0	6	50	62
West Virginia	13	3	6	4	27,242	580	541	0	0	0	1	1	0	0	10	19	29
Wyoming	20	8	4	8	108,307	808	1,096	1	0	1	4	6	25	0	8	188	221
Miscellaneous	0	0	0	0	0	58	113	0	0	0	0	0	4	0	3	46	53
Total United States	**1,232**	697	75	460	4,762,622	50,933	47,094	26	4	6	214	**250**	1,442	192	307	8,972	10,913
Total previous week	1,182	650	91	441	4,673,990			35	5	5	214	259	1,416	188	301	8,758	10,663
Total November 20, 1954	1,042	547	80	415	4,065,772			56	1	10	240	307	1,297	125	359	8,044	9,825
Western Canada	67	44	4	19	309,355												

Service wells included: *6, 14.

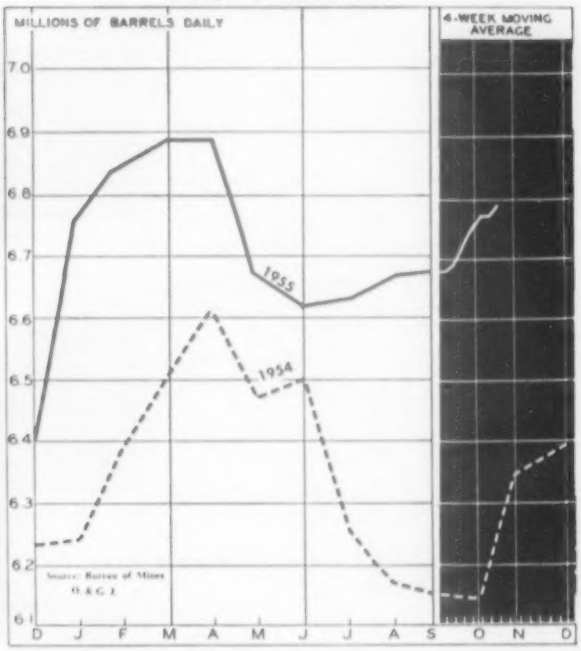
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

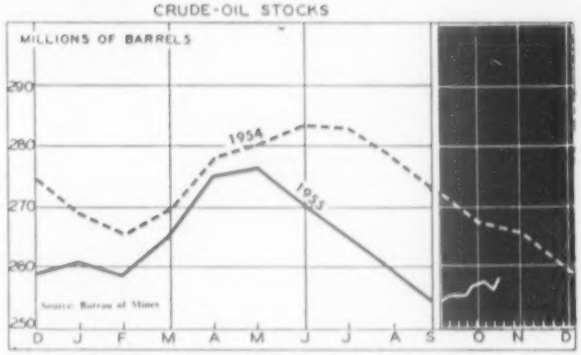


DAILY AVERAGE PRODUCTION FOR WEEK

	November 19			Nov. 12
	Crude oil	Lease condensate	Total	total
Alabama	4,100		4,100	4,100
Arkansas	73,550	400	73,950	74,600
California	974,400		974,400	973,800
Colorado	148,500		148,500	149,500
Eastern	52,100		52,100	52,100
Florida	1,350		1,350	1,350
Illinois	228,400		228,400	229,200
Indiana	29,700		29,700	30,000
Kansas	333,900		333,900	316,900
Kentucky	43,800		43,800	44,000
Louisiana	704,600	57,800	762,400	760,850
North	114,600	2,800	117,400	115,850
South	590,000	55,000	645,000	645,000
Michigan	32,200		32,200	31,900
Mississippi	105,600	4,700	110,300	110,300
Montana	40,400		40,400	41,700
Nebraska	28,100		28,100	27,400
New Mexico	228,800	3,550	232,350	232,450
North Dakota	28,300		28,300	20,400
Oklahoma	566,200		566,200	536,300
Texas	2,834,200	50,925	2,885,125	2,885,125
Dist. 1	54,000	525	54,525	54,525
Dist. 2	151,400	7,975	159,375	159,375
Dist. 3	408,000	24,500	432,500	432,500
Dist. 4	239,000	5,150	244,150	244,150
Dist. 5	48,500	425	48,925	48,925
Dist. 6	125,000	5,300	130,300	130,300
East Texas field	219,500		219,500	219,500
Dist. 7-B	149,000	50	149,050	149,050
Dist. 7-C	170,000	4,300	174,300	174,300
Dist. 8	965,000	2,000	967,000	967,000
Dist. 9	214,000	500	215,300	215,300
Dist. 10	90,000	200	90,200	90,200
Utah	4,800		4,800	5,400
Wyoming	273,800		273,800	272,300
Others	‡250		‡250	100
Total U. S.	6,737,050	117,375	**6,854,425**	6,799,775
Change from previous week, up			**54,650**	
Canada	‡425,600		‡425,600	†356,050
Total U. S. production January 1-November 19			2,177,585,900 bbl.	
Same period last year (crude plus cond.)			*2,048,206,430 bbl.	

*Includes 31,466,500 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nov. 150.

CRUDE-OIL STOCKS



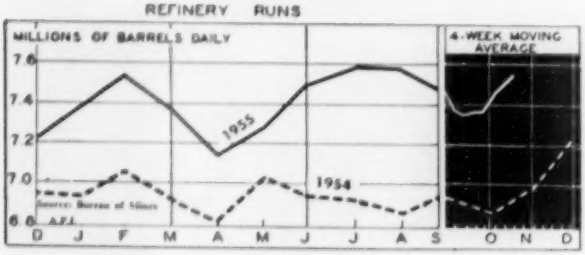
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

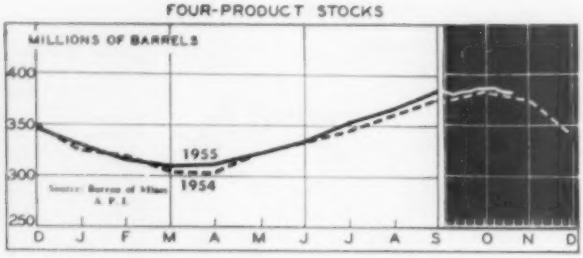
	11-12-55	11-5-55	11-13-55
Pennsylvania Grade	3,058	3,147	3,265
Other Appalachian	1,863	1,765	1,895
Illinois, Indiana, Michigan	9,538	9,147	12,717
Nebraska, North Dakota	2,380	2,350	2,129
Kansas	8,032	8,108	8,527
Oklahoma	21,402	20,781	26,185
Arkansas	2,424	2,472	2,988
Louisiana	15,947	15,813	14,809
North	2,524	3,018	2,293
South	13,423	12,795	12,516
Mississippi	3,099	3,127	3,030
New Mexico	7,179	7,289	8,033
Texas	123,035	122,281	122,063
East Texas proper	8,997	9,023	10,753
West Texas	57,721	57,261	55,013
Texas Gulf	25,464	25,352	23,941
Other Texas	30,853	30,645	32,356
Wyoming	14,619	14,661	13,017
Other Rocky Mountain	5,733	5,843	6,118
California	26,981	27,290	31,923
Foreign	†12,549	12,611	10,350
Total	257,839	256,685	267,049

*Bureau of Mines. †Includes 2,031,000 bbl. in California.

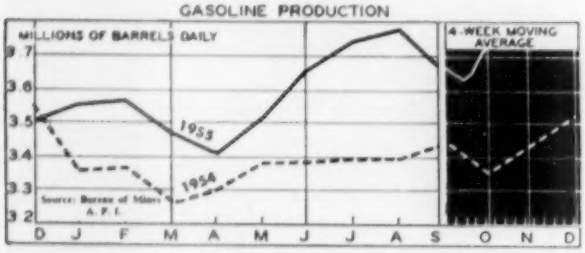
REFINERY RUNS



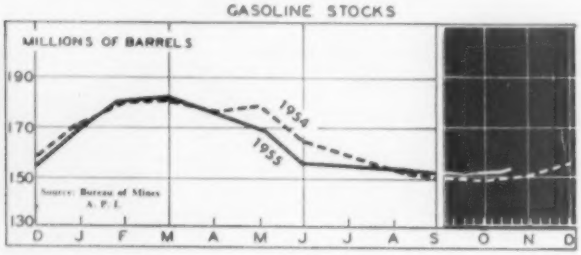
FOUR-PRODUCT STOCKS



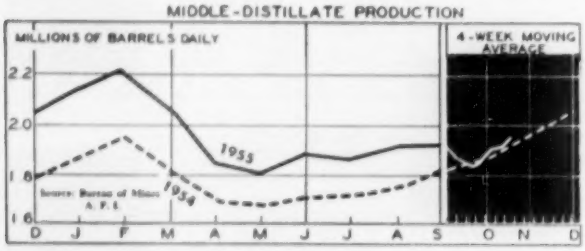
GASOLINE PRODUCTION



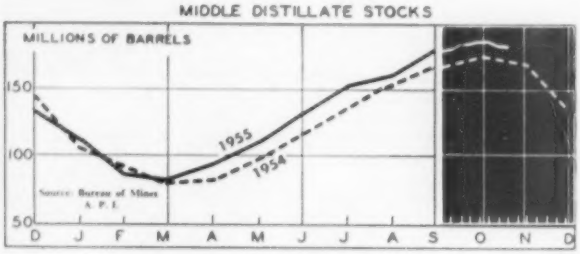
GASOLINE STOCKS



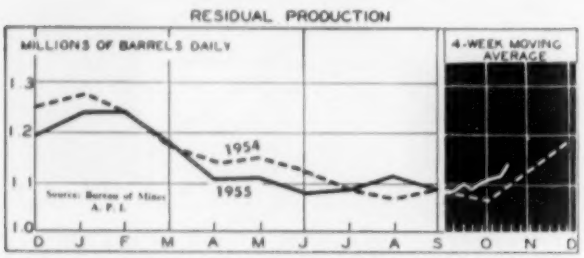
MIDDLE-DISTILLATE PRODUCTION



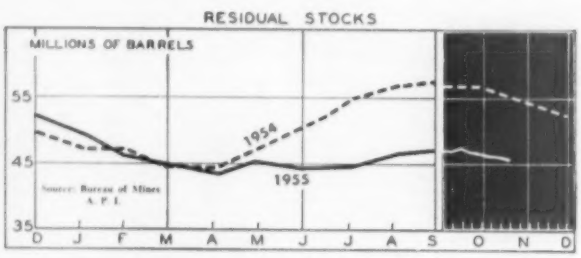
MIDDLE DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, NOVEMBER 18

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1954 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,104	435.0	26.7	271.7	211.3	36,075	14,960	56,414	13,306	989	417.6	28.7	267.6	194.4
Appalachian:														
District 1	105	41.9	5.3	18.9	7.4	4,356	681	3,160	559	93	44.0	5.3	19.9	6.5
District 2	73	45.4	4.4	13.0	11.0	2,216	561	1,144	420	74	33.4	5.9	12.4	8.4
Ind., Ill., Ky.	1,342	740.6	64.4	273.3	185.8	31,318	8,727	28,510	4,916	1,267	670.6	77.6	264.8	168.5
Okla., Kans., Mo.	706	395.9	19.6	160.3	29.6	15,051	2,128	15,230	1,528	623	352.6	17.4	160.7	38.0
Inland Texas	256	185.0	5.9	51.9	18.6	5,606	480	2,942	1,315	224	176.9	9.2	40.9	22.6
Texas Gulf Coast	1,929	908.0	135.9	485.4	264.3	20,179	3,192	17,235	6,952	1,754	824.0	128.7	443.9	233.5
La. Gulf Coast	693	376.7	49.0	187.3	53.0	8,606	2,658	6,362	1,418	603	311.7	64.8	164.5	39.7
N. La. and Ark.	97	35.7	6.1	26.3	5.8	3,890	963	2,319	72	88	38.0	7.4	22.5	6.6
Rocky Mountain:														
New Mexico	22	11.1		4.0	2.9	215	10	62	29	20	11.2	0.7	3.1	3.1
Other Rocky Mtn.	249	121.9	2.7	58.0	37.6	4,928	350	2,805	852	227	108.5	3.9	53.7	33.6
California	1,081	461.4	15.9	156.8	350.1	21,140	434	12,478	13,926	1,013	439.9	4.4	168.2	364.9
Nov. 18, 1955	7,657	3,758.6	335.9	1,706.9	1,177.4	153,580	35,144	148,661	45,293	6,975	3,428.4	354.0	1,622.2	1,119.8
Nov. 11, 1955	7,553	3,686.6	325.4	1,584.4	1,117.9	152,084	35,762	150,606	45,761					
Nov. 19, 1954	7,016	3,360.7	355.0	1,588.7	1,146.7	147,224	36,155	135,353	55,872					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 11-18-55	3,772	3,810
August 1955	3,858	4,033
October 1954	3,362	3,515
November 1954	3,428	3,505
Middle distillate:		
Four weeks ended 11-18-55	1,963	2,083
August 1955	1,910	1,377
October 1954	1,854	1,509
November 1954	1,976	2,247
Residual fuel:		
Four weeks ended 11-18-55	1,141	1,556
August 1955	1,090	1,439
October 1954	1,066	1,429
November 1954	1,120	1,560

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.97			
15-15.9	2.03			
16-16.9	2.09			
17-17.9	2.15			
18-18.9	2.21			
19-19.9	2.27			
20-20.9	2.33	$2.50		$2.37
21-21.9	2.39	2.52		2.39
22-22.9	2.45	2.54		2.41
23-23.9	2.51	2.56		2.43
24-24.9	2.57	2.58	$2.91	2.45
25-25.9	2.63	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

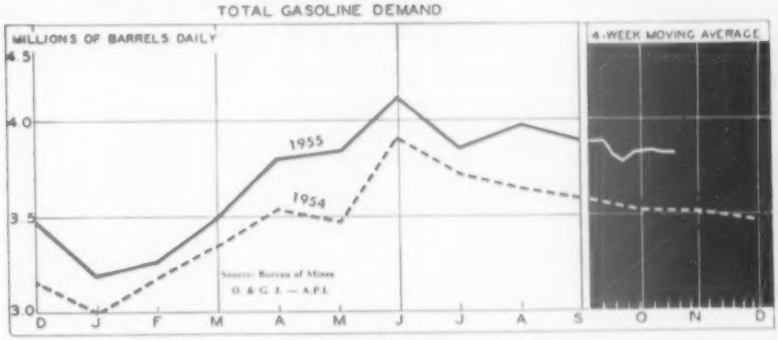
Effective dates. California, October 17, 1955; east of California, June 15, 1953; Pennsylvania Grade, November 1, 1955.

FLAT CRUDE PRICES

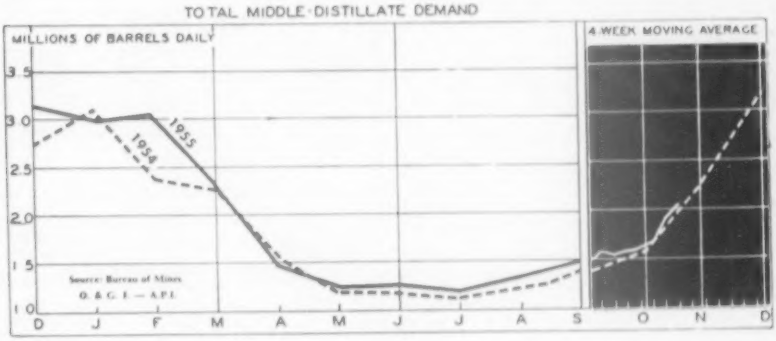
Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.75
Middle District	3.62
Southwest Pennsylvania	3.33
West Virginia	3.21
Buckeye Grade	3.15
Zanesville Grade	2.87
Illinois Basin	3.00

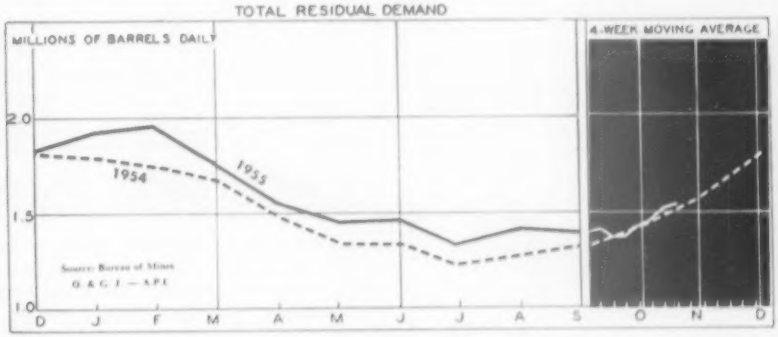
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of November 23, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11-11.25	11.5-12	10.5-10.75
Premium gasoline	12.5-12.75	13-13.75	12-12.25
42-44 w.w. kerosine	9.25-9.50	10.05-10.55	8.75-9.00
No. 2 straw fuel oil	8.25-8.50	9.55-10.05	8.5-8.75
No. 6 residual	$1.75-1.85	$2.55-2.75	$2.10-2.20

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6.0	5.5	5.75
Grade 18-55	7.2	6.7	6.95

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19
200 vis., No. 3 neutral, 0-10 pp.	14.25

WAX

Mid-Continent

132-134 A.M.P.	0.6

● Esso Standard Oil Co. announced removal of the 0.5-cent voluntary summer allowance on kerosine and distillate fuels, effective November 22. This action returns barge deliveries of No. 2 fuel in New York Harbor to 10.05 cents a gallon. There have been a few Group 3 sales of Grade 26-70 natural gasoline at 5.875 cents, but none was reported for November 23.

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GARDNER-DENVER two-stage gas compressor unitized unit powered by 250 H.P. Buda motor and all equipment, gauges and coolers necessary to operate. All in first-class condition. Gulf Southwest Service Co., P. O. Box 1328, Shreveport, La. Telephone 2-8428.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE: Used R. L. Cardwell Drilling-in Unit. Splendid condition with all accessories and large Doghouse. Located near Wichita. Phone or write John Richard, McClelland Hotel, Wichita, Kansas; or write Box 361, Topeka, Kansas.

FOR SALE: National T-12 rig on 32' Tandem Trailer, 145 HP Motor, complete except drill pipe. First class condition, approx. 8 months old. Box J-233, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—At Tallant, Oklahoma, three 5' x 56' Absorbers, 20 Trays, 24" Spacing 500# WP, peak design each 40,000 MCFD at 380 PSIG; Oil Rate 100-300 GPM, min. and max. Bought new 1947, taken out of service 1954. Price $8500.00 each, now standing. Full data upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE EQUIPMENT

FOR SALE—5000' Drilling Rig—Complete for South Texas Drilling—Completely Overhauled—For Price and Complete Inventory write—McKENZIE DRILLING COMPANY, 717 WILSON BUILDING, CORPUS CHRISTI, TEXAS.

FOR SALE—At our Wichita gasolene plant, 901 West McArthur Road, 1—6'x8' Vertical Flint Steel Corp. Gas Scrubber with 3 Trays Mist Extractor, Shell 1¾", Heads 1⅛" Code Welded, stress relieved, design max. WP 400# PSI. Max temperature 100° F. New 1948. $2500.00. Cities Service Oil Patridge, Bartlesville, Oklahoma.

FOR SALE

Practically new Unit-40 drilling rig now operating in West Central Texas. Completely equipped with Moore 136' Heavy Duty Jack knife Derrick, LRO Waukesha power, National C-250 pump and all other accessories. No Brokers. If interested write

Box J-250,
The Oil and Gas Journal,
Tulsa, Oklahoma.

FOR SALE EQUIPMENT

ELI DRILL M6D-164-D on 1948 Ford. New Motor, good rubber. 22' Mast, 13' Kelley, 4½ x 5 G-D Pump, 150' Rod, slush pit and bit subs. SeisDrill, Inc., 515 Thompson Bldg., Tulsa, Oklahoma.

FOR SALE: Autocar Diesel C-160, 1949 model. Dual tandem with Braden C-90 winch, in excellent condition, worth the price. Contact Phone #740, or write P. O. Box #346, Sullivan, Indiana.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

LINE PIPE

7000' of 8⅝" OD, 22.36#, PE, Bev., DRL, LW, straight No. 1 used.
4000' of 10¾" OD, 34.24#, PE, Bev., DRL, LW, straight No. 1 used.
2600' of 12¾" OD, 39.89#, PE, Bev., DRL, LW, straight No. 1 used.
2000' of 12¾" OD, 39.89#, PE, Bev., SRL, LW, straight No. 1 used.

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12" PIPE BENDER

FEDERAL, 2" to 12" cap., COLD NO FILLING OR HEATING, 50 H.P. 3/440 MOTOR. 20 SHOES.

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SIZE	MAKE	TUBES
4500 SQ. FT.	Westinghouse	¾"x15' Brass
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1050 SQ. FT.	N. Y. Shipbuilding	⅝"x6'10" Cupronickel
725 SQ. FT.	C. H. Wheeler	⅝"x5'9" Cupronickel
580 SQ. FT.	Foster Wheeler	⅝"x6'5" Cupronickel
452 SQ. FT.	Heat Transfer	⅝"x8' Muntz
436 SQ. FT.	C. H. Wheeler	⅝"x6'6" Cupronickel
400 SQ. FT.	Allis Chalmers	⅝"x6' Brass

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OWen 5-6351

NEW TRAILERS

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FLAT—BED "TYPE" 2,636.89

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1721 CHICAGO DRIVE S. W.
GRAND RAPIDS, MICHIGAN

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Serial #5696, 4 cyl. Vertical in line, Double Acting, Single Stage, Non-Lubricated Oil Free Air, 1290 SCFM @ 50 psig Discharge Press. Piston speed 600 Ft/Min. Design B HP 184, RPA 450 Bore 11" Stroke 9" Drive 10 V-Belts Std D Section Static Free, Length 10'0" width 8'6" Height 7'6"

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300,000 ft. 12¾" O.D. x .375 Wall, 49.56#, Lapweld, All Machine Cleaned, Straight, App. 20' SRL, Ends Beveled. Used Good Condition

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Tel. East Bank 5611—Mail Address P. O. Box 2921
Roy Crisp—Manager—Charleston, West Virginia

FOR SALE EQUIPMENT

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE—MAYHEW 1000 Drill mounted on 1954-F-600 Ford truck; 850 gallon water tank mounted on 1954 F-600 Ford truck, 18 months old. Working on good contract. 220 feet drill pipe, hand tools, spare parts, etc. Box J-260, The Oil and Gas Journal, Tulsa, Oklahoma.

HOT OIL PUMPS
Worth. 12" KUF Diesel drive.
Nat. Tr. 4x12 HDOEP Duplex.
Worth. 9x5x10 Duplex.

TRANSFER PUMPS
Duplex from 4x3x4 to 10x7x12.

FURNACE TUBES
4-6½ Chrome ½ New Cost.

TOWERS—COLUMNS
4'x59' 160 PSI 23 trays.
2'x47' 375 PSI 20 trays.
3'x49' 425 PSI 28 trays.
7'x54' 150 PSI 20 trays.
7'6"x41' 160 PSI Reactor.

FURNACES
Crude Oil 8 Million BTU.
Light Oil 10 million BTU.

HEAT EXCHANGERS
94 to 550 sq. ft. Steel Tubes.
140 to 440 sq. ft. Adm. Tubes.

COMPRESSORS
1406 SCFM Gas Driven 250 PSI.
211 CFM Motor Drive 100 PSI.

ETHYL BLENDING PLANT
4200 gal. Tank, Scale & Building.

STORAGE TANKS
500 to 20,000 bbl. All Welded.

BOILERS
153 HP 160 PSI Water Tube (3).
250 HP 150 PSI Stirling.

WRITE FOR COMPLETE INVENTORY

Heat & Power Co., Inc.
60 East 42 Street, New York 17, N. Y.
310 Thompson Bldg., Tulsa 3, Okla.

FOR SALE EQUIPMENT

FOR SALE: Bucyrus-Erie Model 24L spudder, complete with core bbl., light plant, large and small tools for top to bottom drilling. Call or write Geo. H. Wickham, Phone 4551, Box 595, Grayville, Illinois.

PORTABLE IRRIGATION UNIT—Mounted on a 6-wheel drive GMC truck. Purchased new in 1951 at a cost of over $22,500. Le Roi engine (Model H-540). Gould pumps. 2500 feet of 8" aluminum pipe. 1300 feet of 6" aluminum pipe. 200 couplers and fittings. All other equipment necessary plus many extras. First-class condition in every respect, used very little. Write Post Office Box 752, Kerrville, Texas.

FOR SALE—At our Arkansas City, Kansas Gasolene Plant, 3—4'x53'9" Tulsa Boiler Type welded absorbers, 20 trays, ⅞" flange quality plate, ASME code welded 400# WP at 120° F., with piping. Lowered, each $6500.00. Complete data upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE
8" Line Pipe

IMMEDIATE DELIVERY

400,000 ft. 8⅝" O.D. x .322 Wall, 28.55#. Lapweld, All Machine Cleaned, Straight, App. 20' SRL. Ends Beveled, Used Good Condition.

3,000—8-V Thread Used Couplings, suitable shopping 8⅝" O.D. Pipe.

SUITABLE FOR
Oil, Water, or Gas Systems,
Water Well Casing, Irrigation Pipe,
Piling or Structural Use

Located: Kansas and Missouri

Large additional quantities same size available soon from present take up and reconditioning operations in Missouri.

Priced Attractively for Prompt Shipment

Humboldt-Chicago Pipe Line Project
125 W. 3rd St., Tulsa, Okla.
CHerry 2-9128, LUther 4-4229

FOR SALE EQUIPMENT

TWO BUCYRUS-ERIE 36L's complete. Also string, 15-inch down, big-hole tools. Tut-Tilley, Wewoka, Okla.

FOR SALE—At our Arkansas City Gasolene Plant—1—31"x61'3" Tulsa Boiler Stabilizer, 35 trays, ¾" flange quality plate shell, ASME code welded, 460# WP at 350° F. stress relieved, with 3'x8' Jacking Engineering reboiler, two Alco 8"x84" and 168" heat exchangers, lowered, lot price $5000.00. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

OUR LEASE EXPIRES DEC. 31

Everything Must Be Sold at Sacrifice Prices!!!

MALLEABLE IRON UNIONS
AND UNION FITTINGS
AAR TYPES—MFG. BY
CRANE AND CORLEY
300 LB. PRESSURE
$100,000 INVENTORY
MUST SELL!!!

UNITED SURPLUS, INC.
2433 Indiana Ave., Chicago 16, Ill.
Tel. CAlumet 5-2688

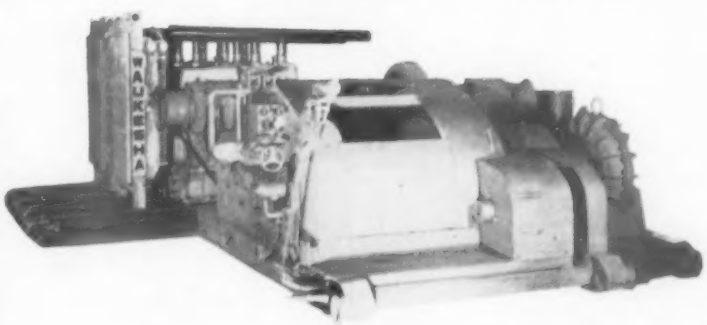
GASOLINE PLANT EQUIPMENT FOR SALE

3—800# MMCF Absorbers with Scrubbers, etc.
1—30" x 62' Depropanizer with Accumulator, Reboiler and Condenser.
1—Fluor "Countertlo" Induced Draft Cooling Tower Complete.

Other equipment, Instruments, Pumps, Pipe, Valves and Fittings necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

SOUTHERN PRODUCTION COMPANY, INC.
P. O. Box 670, Phone FAnnin 8103,
Fort Worth, Texas

IMPROVE YOUR RIGS with NEW-LIKE MACHINERY and Save Money!



- REBUILT National Type 50 Draw Works with two REBUILT Waukesha Model 6NK Engines. Engine parts are standard size throughout.
- Draw Works, Chain Compound and Hydromatic Brake were completely dismantled and components repaired or replaced with new where necessary.
- Engines were dismantled by authorized factory repair shop and components repaired or replaced with new where necessary.
- If Draw Works is desired without power allowance will be made for the engines. The Compound can be modified to receive a third engine.
- This equipment is in new-like condition and represents a most attractive saving. See it at Oklahoma City.

*OTHER NEW-LIKE REBUILT ROTARY DRILLING MACHINERY

- 1 — 17½" Oil Well Spiral Gear Rotary — Short Type
- 1 Set — (2) Byron Jackson Type "B" Tongs with Lugs for 3½" to 6¾" O.D. Pipe.
- 1 Set — (2) 2¾" x 72" Byron Jackson Weldless Elevator Links
- 1 Set — (2) 2¾" x 84" Byron Jackson Weldless Elevator Links
- 1 — 100-Ton Byron Jackson Triplex Hook
- 1 — 4125 Byron Jackson Super Triplex Hook

*Located at Oklahoma City

Oklahoma City
Dallas
Shreveport

LUCEY PRODUCTS CORPORATION
TULSA, OKLAHOMA

Denver
Odessa
Calgary

FOR SALE EQUIPMENT

USED CATERPILLAR Motor D4 600, good condition; new Kobe 7" pump; three used 7" Lucas pumps. Delivery Falls City, Nebraska. Write: Box 231, Scarsdale, N. Y.

ANOTHER BRILL LIQUIDATION

FORMER LACY REFINERY,

BIG SANDY, TEXAS

COMPLETE POLY UNIT, BUILT 1950

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
3—Absorbers, 14" x 40', 20" x 50', 160#
2—Wash Towers, 18" x 23', 150#
1—Reactor, 24" x 28', 550#
1—Depropanizer, 20" x 35', 450#
1—Debutanizer, 12" x 26', 120#
3—Brinkman vertical tube furnaces 3.5, 2, 1½ mil. BTU/hr.
30—Brown fintube exchangers, 600# 11, 21, 77, 101, 140 sq. ft.
3—Adm. heat exchangers 424, 346, 176 sq. ft.
2—Perco reactors 4500 gal., 8' x 12', 347 stls. st. 120#, 1000° F
1—5' x 96' tower, 40 tray, 135# WP
1—7' x 30' Propane tank, 250# WP
1—10' x 50' Crude tower, 18 trays
1—6' x 34' Vacuum tower, 150#
1—2' x 50' tower, 24 trays
3—Welded tanks, 10' x 40', 10' x 30', 5' x 20'
3—St. exchs., 2000, 1500, 480 sq. ft.
9—Oilfield boilers, 125 hp., 275#
1—Ethyl lead plant
3—Penn. comp. 8 x 11 x 9, 12 x 11½ x 13, 10 x 6 x 11
2—Convection furnaces, 4-6 ch tubing
1—Vapor phase cracking furnace
30—Welded storage tanks, 5000, 2000, 1000, 500 Bbl.
1—Waukesha anti-knock machine
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8
30—Duplex piston pumps, all sizes
1—10' x 30' asphalt still
6—Steel Bldgs., 20 x 150, 12 x 20, 20 x 40, 20 x 30.
2—Pritchard cooling towers. Adm. Bentube exchanges
1—BS&B Oil & gas separator, 10.7 mcf, 3500 Bbl./day.

COMPRESSOR STATION—BALT., MD.

3—600 hp IR KVG Gas Comp.
1—MWK 2400 sq. ft. adm. exch. 150#

FINAL LIQUIDATION, LEVELLAND, TEX.

1—42' x 49' stabilizer, 180#, 28 tray
1—42" x 49' stabilizer, 180#, 28 tray
5' x 40' ch lined vessel, 90#
30,000 ft. 4, 6 in. pipe
5,000 ft. 2", 4", 4-6 ch pipe

EQUIPMENT ELSEWHERE

COLUMNS

7' x 115' 50 tray
8' x 75' 25 tray 40#
2' x 60' 35 tray 500#

HEAT EXCHANGERS

6—Adm. 785, 742, 425 sq. ft.
3—St. 2000, 785 sq. ft.
30—Atmospheric Bentube exch., stls and Adm. 715, 470 sq. ft.
30—304 SS shell & tube condensers 100-1000 sq. ft.

MISCELLANEOUS

Lab Petro-chem furnace 50,000 BTU/hr.
Gould 4" Pump 400 gpm 1600' hd
B-J hot oil pump 3 x 9, 13 st., 325 gpm, 4620' hd
Gould 16" pump 10,500 gpm, 135' hd.
Tremendous selection stainless steel and steel valves ½" - 6"

Partial List Only

WIRE PHONE WRITE

For Detailed Circular

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1151
Or
2401 Third Ave., New York 51, N. Y., CYpress 2-5701

FOR SALE EQUIPMENT

GAS METERS: Foxboro, Emco and Westcott Orifice Meters for sale. Geo. R. Milner, Box 124, Okmulgee, Okla.

3500 FT. Wilson Rotary Rig complete. Air controlled. 3200 ft. 4½ F. H. Drill Pipe. 4 Drill Collars. 7¼x10 FXO Gardner-Denver Pump. All Butane equipped. Call #2 or #411, Cleveland, Oklahoma, RIverside 7-0650. Tulsa, Okla.

185 H.P. SUPERIOR, horizontal, twin, direct-connected engine and compressor with 8 x 16 Ingersoll-Rand power cylinders, in running condition, including some spare parts. Location central Oklahoma. Dorset Company, 610 National Bank of Tulsa Building. LUther 4-7769.

FOR SALE: 2 Type 80 Cooper Twin Gas Engine Driven Compressors rebuilt like new ready to go. Compressor Cylinders to suit. Write or phone W. S. Smith, 205 Thompson Bldg., Tulsa, Okla. LUther 2-5473.

MAYHEW MODEL 1000 mounted on Ford F-800 1954 truck with 18 lengths drill pipe, 6" and 8" bits. Equipment one year old, excellent condition. Write Kohl Bros., 21st & Greenwood, Harrisburg, Penna.

NEED A PIPE LINE

Have 800 Miles 8" Line Pipe we are taking up through Illinois, Indiana, and Ohio. Will furnish pipe, go in on a deal, or finance.

We are open for any kind of deal.

REDNEB PIPE CO.

P. O. Box 1798 Shreveport, La.

Phone 4-7767—68

FOR SALE

NEW SLIM HOLE TRAILER MOUNT RIG

CAPACITY: 6700' w/4"—7700' w/3½"—10,000' w/2⅞"

Bethlehem S-45-E drawworks—G. M. Twin Diesel Motors—Lee C. Moore 94' mast mounted on triple axle tandem assembly also 8'-8" sub-structure—Bethlehem 225—8" x 14" pump w/ G. M. Twin Diesel Motors—Bethlehem 510—5½" x 10" auxiliary pump w/ G. M. Single Diesel motor—6500' new grade E drill pipe—6 drill collars—never rigged up—ready to go—can be purchased at considerable saving—shown by appointment.

VERNON WHITELY DRILLING COMPANY

TYLER, TEXAS

Telephones 2-2212 and 2-6896

EQUIPMENT WANTED

14-IN. MUD PUMP and motor and other rotary equipment for 4,500 ft. Tut-Tilley, Wewoka, Okla.

HELP WANTED

PETROLEUM ENGINEER

Must have degree. Three to five years experience in field. Salary open. Age limit—35 years. Contact

Reynolds Mining Corp.

P. O. BOX 1328,
DURANGO, COLO.

HELP WANTED

WANTED as Sales Representatives. Retired drilling engineer, familiar with mud problems and drilling. Attractive offer. Exclusive territory. P. O. Box 4183, Station A, San Antonio, Texas.

SEISMOGRAPH Computer. Must be experienced and free to travel. Box J-234, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT oil and gas company desires to hire petroleum engineer to supervise production and well completion of gas and oil properties in East Texas, Louisiana. Immediate opening. All replies confidential. Box J-228, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED BY OIL COMPANY

Material Control Clerk with oil and gas experience. At least high school education, salary range between $350 and $400 depending on qualifications. Reply

Reynolds Mining Corp.

P. O. BOX 1328,
DURANGO, COLO.

AREA ENGINEERS

Several graduate engineers with minimum 5 years' experience supervising maintenance engineering functions in oil refining or producing facilities, power plants, heavy industrial installations, manufacturing plants or related operations. To establish technical supervision, procedures, maintenance operations and schedule routine and special work for major oil producing and refining operation with all supporting facilities; i.e., housing, feeding, recreation, etc.

Salary commensurate with background and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 64

ARABIAN AMERICAN OIL COMPANY

505 PARK AVENUE

NEW YORK 22, NEW YORK

PETROLEUM ENGINEERS

Experienced graduate engineers for immediate openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

SUPERVISORY PETROLEUM ENGINEER

For responsible staff position in Saudi Arabia, directing the work of experienced engineers making Petroleum Reservoir Studies. Advise management on Petroleum Reservoir Engineering problems.

Salaries commensurate with training and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN-AMERICAN OIL COMPANY

505 PARK AVENUE

NEW YORK 22, NEW YORK

HELP WANTED

SALES REPRESENTATIVES WANTED:

Manufacturer of Oil-Gas Separating, Treating, and Metering Equipment wants commission Sales Representatives for (1) North Texas (2) East Texas, Southern Arkansas, Northern Louisiana (3) South Texas (4) Texas Panhandle (5) Williston Basin (6) Illinois, Indiana, Kentucky (7) California (8) Canada. Territories available on exclusive contract basis to qualified and experienced men. Please give details concerning present sales coverage, lines handled, and sales personnel when answering.

Box J-231, The Oil and Gas Journal, Tulsa, Oklahoma

WANTED:—Lease Records Man with minimum two years experience, to be located in New Orleans, Louisiana with prominent company. Box J-255, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 4 or 5 years experience with emphasis on valuation and Reservoir Engineering. Must be free to travel with Dallas as headquarters. Initial letter application should set out past experience in detail, education and salary requirements. Box J-259, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

OIL AND GAS LAWYER. Large oil company, engaged in all branches petroleum business overseas, with headquarters in New York, desires attorney for its legal staff with 5-10 years' experience in oil and gas law. Must be personable and willing to travel extensively abroad. Applicants should furnish detailed resume of educational background and legal experience and indicate salary desired. Box J-256, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTIMATORS

Experienced in Process Equipment and piping costs, for Chemical Plant & refinery construction. Position offers good future with progressive Penna. firm. Send resume to

T-93, P. O. BOX 3493
Philadelphia 22, Pa.

PARTY CHIEFS
SEISMOLOGISTS
COMPUTERS
OBSERVERS

WORLD-WIDE SEISMOGRAPH CONTRACTING ORGANIZATION

offers technical careers to qualified experienced applicants. Highly attractive starting salaries with good opportunities for advancement within both domestic and foreign areas.

United Geophysical Corporation
POST OFFICE BOX "M"
PASADENA, CALIFORNIA

ENGINEERS
MECHANICAL
ELECTRICAL
CIVIL

A large crude oil pipe line company, operating within Oklahoma, has openings for Engineering graduates. Diversified, interesting and permanent employment with advancement opportunities. Experience not essential, but a reasonable knowledge of hydraulics, office and field work in the design of crude oil pipe lines and pump stations is desirable. Submit resume and salary requirements including a recent snapshot to—

Box J-249,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

GRADUATE PETROLEUM ENGINEER—Oil company has opening at Midland, Texas, for aggressive field production engineer, under 38 years of age, with minimum of two years' West Texas experience plus proven ability in testing, drill stems, workovers and completions. P. O. Box 3053, Dallas, Texas.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

SALES ENGINEERS

Capable of representing country's leading manufacturer of engines for oil field pumping and other auxiliary services. Excellent opportunity for high caliber man. Headquarters Tulsa, territory Mid-Continent. Opening immediately. Please give transcript of experience, and state salary expected. All replies will be treated confidentially.

Box J-209, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED BY OIL COMPANY

Mapping Draftsman, preferably with some geological drafting background. Salary open. Reply

Reynolds Mining Corp.
OIL AND GAS DIVISION,
BOX 1328,
DURANGO, COLO.

Plant
Equipment
Inspectors

Graduate engineers with minimum 5 years' experience in design or inspection of petroleum processing plants and equipment. Major part of experience must have been in inspection work entailing general knowledge of all facilities. Develop inspection methods, supervise and conduct inspections and advise operations on codes and equipment limitations in a major oil installation located in Saudi Arabia.

Write giving full particulars regarding personal history and work experience. Please include your telephone number.

Recruiting Supervisor, Box 90

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

SITUATIONS WANTED

LANDMAN—4 Years Major, Rockies; titles, leasing, joint ventures, federal units; B.C.S., L.L.B.; available January. Box J-257, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER: College graduate with general refinery experience, including laboratory engineering and operations supervisor. Desire non-operating position in design sales as service. Box J-261, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER with over 10 years drilling and production experience in Southern Louisiana. Desire affiliation with progressive organization. Box J-244, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRES RESPONSIBLE Oil Executive Position. Degrees B.S. Petroleum Geology, B.B.A., Major Personnel Management, also Petroleum Engineering, Oil and Gas Law. Experience in Seismograph Subsurface Geology, 5 years Oil and Gas Taxation with Federal Government. Box J-215, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—Nineteen years seismic experience. Thoroughly experienced in supervision of crews in Rocky Mountain and Mid-Continent areas. Box J-236, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN—32, presently employed, five years experience as District Landman for major company in Rockies. L.L.B. Desires position with expanding independent or small company. Box J-254, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE Petroleum Engineer-Geologist, 35, employed, registered. Seeks challenging position with independent, drilling contractor, or transmission company. Eleven years active varied experience with major and independent in Kansas, Oklahoma, and Texas. Box J-229, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Production.

FOR SALE: 160 acre lease, 22 barrel oil per day, 300 barrel storage. Three wells. Cash. Elmer Sieg, Wellsville, Kansas.

56 ACRES, D. J. McKenzie Survey, Abst. 833, Tyler County, Texas. ⅞ lease want drilled. Investigate, make offer. Prince Angelloz, 3008 Central Ave., Port Arthur, Texas.

HAVE DRILLING DEAL IN ILLINOIS with wonderful geology, that I will sacrifice for $50 per acre, a one-eighth override, and three wells drilled to 3,000 feet within six months. Must be checked to appreciate its possibilities. Do not answer unless you are financially able to carry out the requirements.

Box J-206, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited
B. D. BUCKLEY
8635 Delmar Ave., St. Louis, Mo.

Offset Drilling Locations

Experienced Oil Drilling Co.—owning producing oil leases—will drill you one or more wells—directly offsetting good producing wells in Tulsa Co., Okla.—at actual cost—providing you equip and complete wells into tanks and pipeline—for a one half interest. Depth 1600'. Write

BOX J-241,
THE OIL AND GAS JOURNAL.
TULSA, OKLAHOMA.

15,500 ACRES

RANDOLPH & TUCKER COUNTIES, W. Va., 2½ miles from substantial gas production. Geology indicates Oriskany sand at 8,000 feet. Drilling contract desired.

WEST VIRGINIA COAL & TIMBER CO.
PHILIP L. POE, V. P.,
210 E. Redwood St.,
Baltimore 2, Md.

SCOUTING SERVICE

APPALACHIAN BASIN—Weekly scout reports, exploration and development: New York, Penna., & W. Va. For information write: H & H Scouting Service, Box 312 Coudersport, Pa.

BUSINESS OPPORTUNITIES

AGGRESSIVE Manufacturers agency calling on field production personnel has opening for additional account. Box J-246, The Oil and Gas Journal, Tulsa, Oklahoma.

GOLD-SILVER-COPPER romance is really thrilling if you have sporting money; plus a chance to win. YORK MINES, Box 1135, ALBUQUERQUE, N. M.

OIL AND GAS Property For Sale. $10,000 per Month Income, plus 5,000 acres undeveloped located in Jackson County, West Virginia. Box J-238, The Oil and Gas Journal, Tulsa, Oklahoma.

WE HAVE TEXAS CLIENT

Who has asked us to find them from 500 to 5000 barrels per day settled production, Texas, Oklahoma, Louisiana or New Mexico. Inspection can begin within 24 hours. Principals only and in strict Confidence.

COMBEST ROYALTY COMPANY
Amarillo, Texas

MAP WEIGHTS

JUST LIKE AN EXTRA PAIR OF HANDS. Kraftbilt 20-ounce cream-colored horsehide weights hug drawings or maps to the table while you work. Hand-sewn with heavy duty stitching, they're shot-filled and round in shape for ease of use and long life. Ask for Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

LEGAL

We offer for sale perpetual oil, gas and other mineral rights under the following described real property for the purpose of closing the Estate of W. H. Johnson, deceased:

IN KEARNY COUNTY, KANSAS

Mineral Acres	Description
74.47	NW¼ 18-25S-36W
74.61	SW¼ 18-25S-36W
80	SE¼ 18-25S-36W
80	NE¼ 19-25S-36W
79.75	NW¼ 19-25S-36W
40	E½ SW¼ 19-25S-36W
40	NE¼ 13-25S-37W
38.18	NW¼ 13-25S-37W
40	SW¼ 13-25S-37W
40	SE¼ 13-25S-37W
80	SW¼ 24-25S-37W
80	SE¼ 24-25S-37W
80	NE¼ 25-25S-37W
80	NW¼ 25-25S-37W
80	SW¼ 25-25S-37W
80	SE¼ 25-25S-37W
80	NE¼ 26-25S-37W
80	NW¼ 26-25S-37W
80	SE¼ 26-25S-37W
40	NW¼ 35-25S-37W
10	NE¼ of SE¼ 35-25S-37W
30	S½ & NW¼ of NE¼ 35-25S-37W
80	NW¼ 36-25S-37W

All with a producing gas well located near the center of each section. Royalties on gas produced go to purchaser commencing January 1, 1956.

IN HAMILTON COUNTY, KANSAS

54	SE¼ 28-24S-39W
60	E½ E½ 33-24S-39W
45	NW¼ & S½ of NW¼ 34-24S-39W
60	SW¼ 34-24S-39W
60	NE¼ 4-25S-39W
60	SE¼ 4-25S-39W

All under oil and gas lease providing for $1.00 per acre delay rentals.

All conveyances will be by Mineral Deed with Certificates of Title furnished showing merchantable title in Grantors subject to existing oil and gas leases. Bids are to be made on each individual tract and/or on the entire acreage as desired. Sealed bids will be received until December 5, 1955 at 10:00 A.M. MST, and will be opened at that time at the Office of C. E. Beymer, Beymer Bldg., Lakin, Kansas. Mark on envelope "Mineral Bid, W. H. Johnson Estate." Check for 10% must accompany bid with the balance payable upon approval of title. The right is reserved to reject any or all bids.

C. E. Beymer, Lakin, Kansas, Attorney for Executors and Trustees. Clyde E. Beymer, Chas. H. Browne and Roy E. Menn, Executors and Trustees of the Estate of W. H. Johnson, Deceased, Lakin, Kansas.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware.

WANTED

OIL OR GAS PRODUCTION wanted by Principal up to 2,000 bbl. per day. Furnish details to Box J-258, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED WILDCAT ACREAGE, Eastern Kansas and Oklahoma, for test well, large or small blocks. Box J-253, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL PROPERTIES WANTED "Oil properties wanted, settled or semi-settled production of 100 to 2,500 barrels daily in Oklahoma and Kansas. Property must stand thorough inspection. Contact Morris Sitrin 1215 First National Building, Tulsa, Okla homa with particulars

ROYALTIES

IN THE HEART of the Williston Basin Landowners Royalties in major company blocks. Landowners Royalties Company, Box 1225, Great Falls, Montana.

MAJOR POOLS in Oklahoma; choice royalties offered, with large estimated reserves. A. S. Berry, P. O. Box 1383, Tulsa, Okla

FARMS AND RANCHES

BEAUTIFUL RIO GRANDE VALLEY—The Garden Spot of Texas. Ideal Climate Year Around. One of the best 500 acres cotton, grain and vegetable farms in the entire valley. Two powerful wells for irrigation. Good level land. Near Harlingen, Texas. Priced for quick sale, $290.00 per acre. Consider some trade. No more like it at the price. Terms. JONES-CALVERT CO., 610 S. Hampton, Dallas, Texas.

LEGAL NOTICE

NOTICE OF SALE OF INTERESTS IN PRODUCING OIL AND GAS PROPERTIES

Notice is hereby given that the undersigned, Wm. B. Prugh and J. D. Land, Trustees of OKLAHOMA-TEXAS TRUST, an Express Trust organized under the laws of the State of Oklahoma, will offer for sale at public auction and sell to the highest bidder, for cash, the interests of Oklahoma-Texas Trust, an Express Trust, in producing oil and gas properties located in the States of Kansas, Oklahoma, and Texas, on the 12th day of December, 1955, at 11 o'clock A. M., in the office of Oklahoma-Texas Trust at 907 Kennedy Building, Tulsa 3, Oklahoma.

All interests of the Trust in producing oil and gas properties located in each state will be combined and sold as a single unit. The interests of the Trust to be sold are as follows:

TEXAS:

12 Producing Wells in East Texas Field—Full 7/8ths W. I.

OKLAHOMA:

5 Producing Wells in Oklahoma City Field—Full 7/8ths W. I.
3 Producing Wells in Oklahoma City Field—Various Interests

KANSAS:

19 Producing Wells in Barton County, Kansas—Various Interests
2 Producing Wells in Russell County, Kansas—7/8nds of 5/8ths of 7/8ths W. I.
Wells located in Barton and Russell Counties, Kansas, are subject to an option to purchase by owners of the remaining leasehold interests.

The Trustees, however, reserve the absolute right to reject any and all bids made during the public auction. A cashier's check, certified check, or cash equivalent to ten per cent (10%) of the total bid accepted shall be paid at the time of sale, and the balance due, upon approval of title, not to exceed ninety (90) days thereafter.

Information concerning the above-described properties, together with all engineering reports and production data, are available for examination by prospective bidders in the office of the Trust.

The interests in the above properties are being sold in accordance with Article VI of the Trust Indenture, dated December 7, 1935, as amended, under which said Trust was created. Article XIX provides that the Trust shall terminate at the expiration of twenty years, and the Trustees shall immediately proceed to liquidate and wind up the affairs of the Trust.

DATED at Tulsa, Oklahoma, this 25th day of October, 1955

Wm. B. Prugh, J. D. Land
"Trustees"

LEGAL NOTICE

NOTICE OF SALE OF INTERESTS IN PRODUCING OIL AND GAS PROPERTIES

Notice is hereby given that the undersigned, Wm. B. Prugh and J. D. Land, Trustees of LARKINS-WARR TRUST, an Express Trust organized under the laws of the State of Oklahoma, will offer for sale at public auction and sell to the highest bidder, for cash, the interests of Larkins-Warr Trust, an Express Trust, in four producing oil leases located in the Oklahoma City field, on the 12th day of December, 1955, at 10 o'clock a. m.

The interests of the Trust in the following properties will be combined and sold as a single unit, to-wit:

		Fractional Interest	Net Interest
1 Producing Well	Carney Lease	1/2 of 7/8 W.I.	58.33333
1 Producing Well	Goodwin Lease	1/2 of 7/8 W.I.	58.33333
1 Producing Well	Katy B-4 Lease	1/2 of 7/8 W.I.	58.33333
1 Producing Well	Travis Lease	1/2 of 7/8 W.I.	58.33333

These four wells produced 29,733 gross barrels of oil for the first nine months of 1955.

The undersigned Trustees will sell at public auction the above-described interests of Larkins-Warr Trust in the office of the Trust, 907 Kennedy Building, Tulsa 3, Oklahoma, on the 12th day of December, 1955 at 10 o'clock a. m. The Trustees, however, reserve the absolute right to reject any and all bids. A cashier's check, certified check, or cash equivalent to ten per cent (10%) of the total bid accepted shall be paid at the time of sale and the balance due upon approval of title not to exceed ninety (90) days thereafter.

Information concerning the above-described leases, together with all engineering reports and production data, are available for examination by prospective bidders in the office of the Trust.

The interests in the above leases are being sold in accordance with Article VI of the Trust Indenture, dated November 1, 1934, under which said Trust was created. Article VI provides that the Trust shall terminate at the expiration of a twenty-one (21) year period, and the Trustees will then proceed to liquidate and wind up the affairs of the Trust.

DATED at Tulsa, Oklahoma, this 25th day of October, 1955

Wm. B. Prugh, J. D. Land
"Trustees"

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that approximately 292.03 acres of land in three parcels: Parcel 1: sec. 4, Lots 3, 4, 5, 6, 7 containing 110.38 acres; Parcel 2: sec. 5, Lots 1, 4, 5, 7 containing 141.65 acres; Parcel 3: sec. 9, SW¼ SW¼ containing 40 acres, all in T. 129 N., R. 106 W., 5th P. M., North Dakota, and within the known geologic structure of Cedar Creek Field, North Dakota, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 p. m., M.S.T., January 25, 1956, when bids will be opened. The successful bidder(s) will reimburse the Bureau of Land Management for their proportionate share of the publication costs of this sale. Details of the Lease offering and how and where to submit bids, may be obtained from the Manager of the Land Office, 1245 North 29th Street, Billings, Montana. Orval G. Hadley, Manager, Land Office.

LEGAL

Sealed bids will be received until 1:00 P. M., Friday, December 16, 1955, and opened at that time at the Shawnee Indian Sub-Agency for the leasing of allotted Indian lands located in Pottawatomie, Cleveland, Lincoln, Logan and Payne Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Robert D. Grover, Area Field Representative, Shawnee, Oklahoma. (Telephone No. 318).

LEGAL

SEALED BIDS FOR OIL AND GAS leases on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Indian Agency, Crow Agency, Montana, until 2:00 o'clock (M.S.T.), Wednesday, December 7, 1955 at which time they will be opened and publicly read. Twenty (20) Units involving 7,212.73 acres of trust Indian Lands, a portion of which mineral rights are reserved for the benefit of the Crow Tribe by Act of Congress, will be offered. For further detailed information and list of lands advertised call or write L. C. Lippert, Superintendent, Crow Indian Agency, Crow Agency, Montana.

LEGAL

Sealed bids will be received until December 14, 2:00 P. M. Mountain Standard Time, and opened at that time in the office of the Superintendent, Fort Belknap Consolidated Agency, Harlem, Montana, for the leasing of 1,288.34 acres of Tribal land and 19,003.90 acres of allotted Indian land located in Township 28 North, and Ranges 24 and 25 East, Principal Meridian, Montana, County of Blaine, Montana for oil and gas mining purposes. For further detailed information and a list of lands advertised call or write Darrell Fleming, Superintendent, Fort Belknap Consolidated Agency, Harlem, Montana. Telephone 5R-1.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that the following described land located in Montana and within the known geological structure of the fields identified will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre. CUT BANK Field, Glacier County, Parcel No. 1, T. 34 N., R. 6 W., P. M., Mont., Sec. 22, Lot 2 containing 31.66 acres; Parcel No. 2, T 33 N., R. 6 W., P. M., Mont., Sec. 3, Lot 1 containing 4.05 acres. KEVIN-SUNBURST field, Toole County; Parcel No. 3, T. 35 N., R. 1 W., P. M. Mont., Sec. 33, W½ SW¼ containing 80 acres; Parcel No. 4, T. 34 N., R. 2 W., P. M., Mont., Sec. 6, S½ NE¼, SE¼ containing 240 acres; Parcel No. 5, T. 35 N., R. 3 W., P. M. Mont., Sec. 27, SW¼ NE¼, SE¼, E½ SW¼ containing 280 acres; Parcel No. 6, T. 35 N., R. 3 W., Sec. 34, NW¼ NE¼, NE¼ NW¼ containing 80 acres. BOWDOIN Field in Valley County, all land in T. 31 N., R. 35 E., P. M., Mont., and subject to provisions of special stipulation identified as Section 3g; Parcel No. 7, Sec. 15, NE¼ SW¼ containing 40 acres. Parcel No. 8: Sec. 21, W½, W½ E½, SE¼ SE¼ containing 520 acres. Parcel No. 9: Sec. 20; all, containing 640 acres. Date of the sale is 10:00 A. M., M.S.T., January 25, 1956, when bids will be opened. The successful bidder(s) will reimburse the Bureau of Land Management for their proportionate share of the publication costs of the sale. Details of the lease offering, special stipulations, how and where to submit bids, may be obtained from the Manager, Land Office, 1245 North 29th Street, Billings, Montana. Orval G. Hadley, Manager, Land Office.

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Successful Wildcats

(Continued from page 163)

Block 54, South Timbalier area, Gulf of Mexico. IP 49.56 BOPD, 9/64-in., GOR 250 cu. ft. per bbl., 35.9°, perforations 6,854-66 ft. TD 9,000 ft. (New pay in South Timbalier Block 54 field.)

KANSAS

Edwards County: Skelly Oil Co. 1 Miller, NE NW NE 12-25s-16w. IP 2,860 M.c.f. of gas per day, conglomerate 4,202-12 ft. TD 4,655 ft. (Opens Edstaff gas pool).

MICHIGAN

Allega County: Louis Zellman 4 B. Zellman, NW SE NE 25-4n-13w. IPP 11 BOD, from lower Detroit River pays, 2,078-82, 2,092-2,100 ft. 38°-gravity oil. TD 2,108 ft. (New pool, deeper horizon southwest Michigan.)

COLORADO

Morgan County: Wyoming Oil & Gas Co. 1 Johnson, SW SE SE 15-1n-59w. IPF 350 BOPD, "J" sand discovery, new field. TD 6,344 ft. Skull Creek.

WYOMING

Laramie County: C. M. & W. Drilling Co. 1 Wilhelm, C NE SE 30-14n-60w. IPP 120 BOPD, "J" sand discovery, new pool in Denver-Julesburg basin area of Wyoming. TD 7,462 ft. "J" sand.

Suphlette County, Hogsback Unit: General Petroleum Corp. 87-19 Unit, NE SE SE 19-27n-113w. IP 19,500 M.c.f. of gas per day, Frontier sand discovery, new gas field. TD 7,153 ft. Second Frontier sand.

SASKATCHEWAN

Sohio 1-27 Halbrite, LSD 1, 27-6-12w2. Charles oil well. TD 4,683 ft.

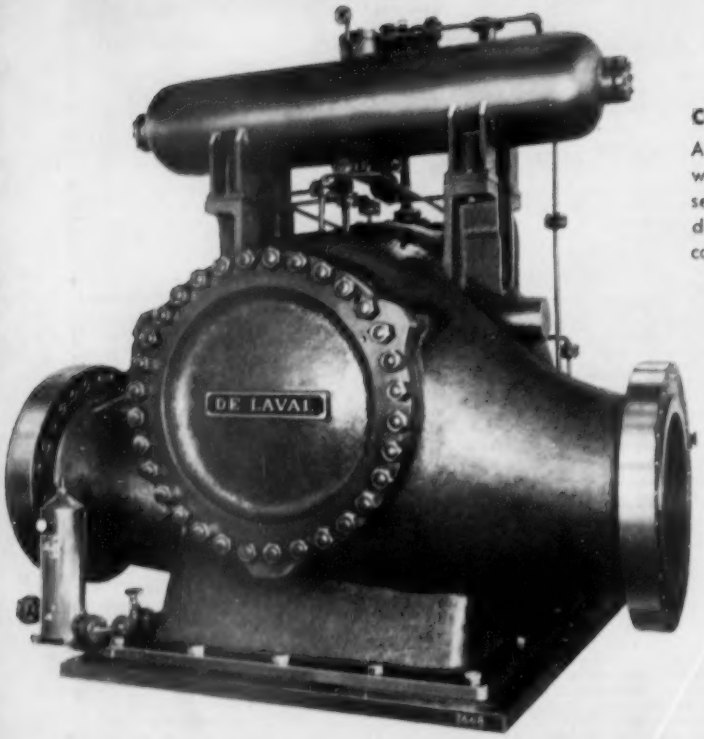
ALBERTA

Mobil-CPR 32-12 Wilson, LSD 12, 32-7-20w4. Madison oil well. TD 4,341 ft.

Colorado-NUI. 10-30 Tofield, LSD 10, 30-51-18w4. Viking gas well. TD 4,035 ft.

DE LAVAL
CENTRIFUGAL PIPELINE COMPRESSORS

come in two "packages" for easy installation

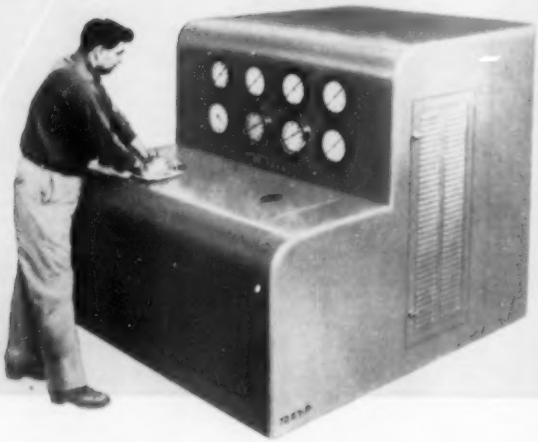


COMPRESSOR

A De Laval compressor with its emergency seal tank mounted directly on the compressor.

CONSOLE

The console contains the filters, motor-driven pumps, coolers, pressure switches, gauges and other accessories. It eliminates complicated piping on the packaged compressor . . . also serves as a protective cover for the equipment it houses.



Bulletin 503 gives data on De Laval centrifugal pipeline compressors. Write for your copy.

Designed in two packages, rugged De Laval centrifugal compressors offer many important engineering features. Among these are • high pressure contact shaft seal which eliminates gas leakage • heavy and rigid construction throughout • high load carrying capacity. The compressor and console arrangement makes De Laval centrifugal compressors easy to install—only simple low-cost foundations are required. De Laval units, totaling more than 280,000 horsepower, are now in operation on major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL-

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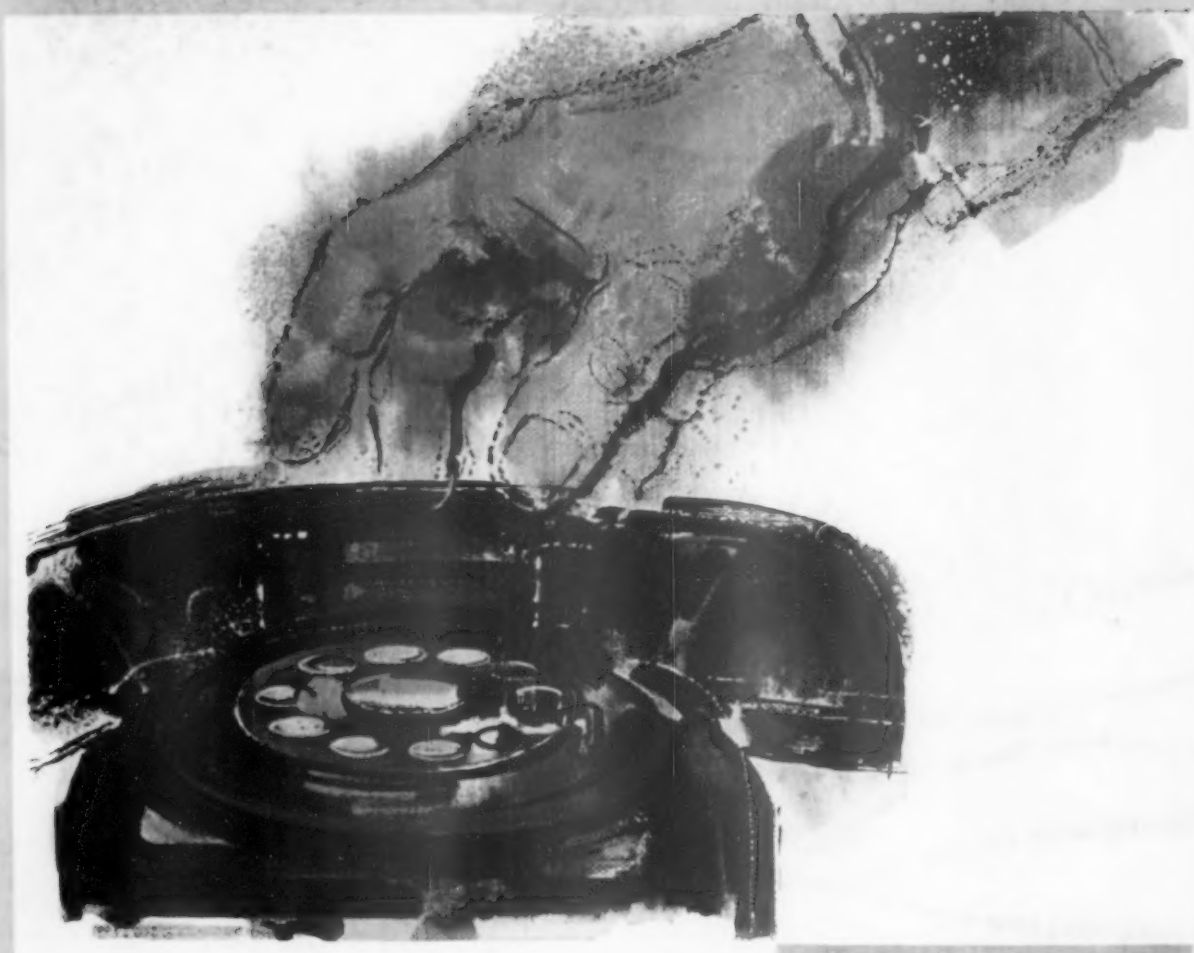

We're closer than your telephone....

At Hughes we like to feel that our rock bit service puts us closer than your telephone. For Hughes service requires that each field representative know *in advance* — through personal contact — the bit requirements of the rigs drilling in his area... and have the right bits on these rigs... *ahead of time!* Through our experienced service organizations we serve every active drilling area in the United States and Canada.